

# DUESENBERG

THE ORIGINAL STRAIGHT EIGHT - PIONEERS OF FOUR WHEEL BRAKES

## LUBRICATION INSTRUCTIONS

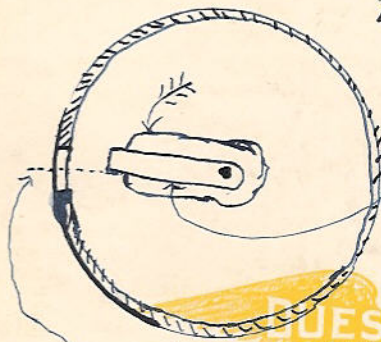


DUESENBERG MOTORS COMPANY  
INDIANAPOLIS, IND.,  
U.S.A.



# Lubrication Instructions

TO TIME MOTOR



center line of slot or  
notch in casing

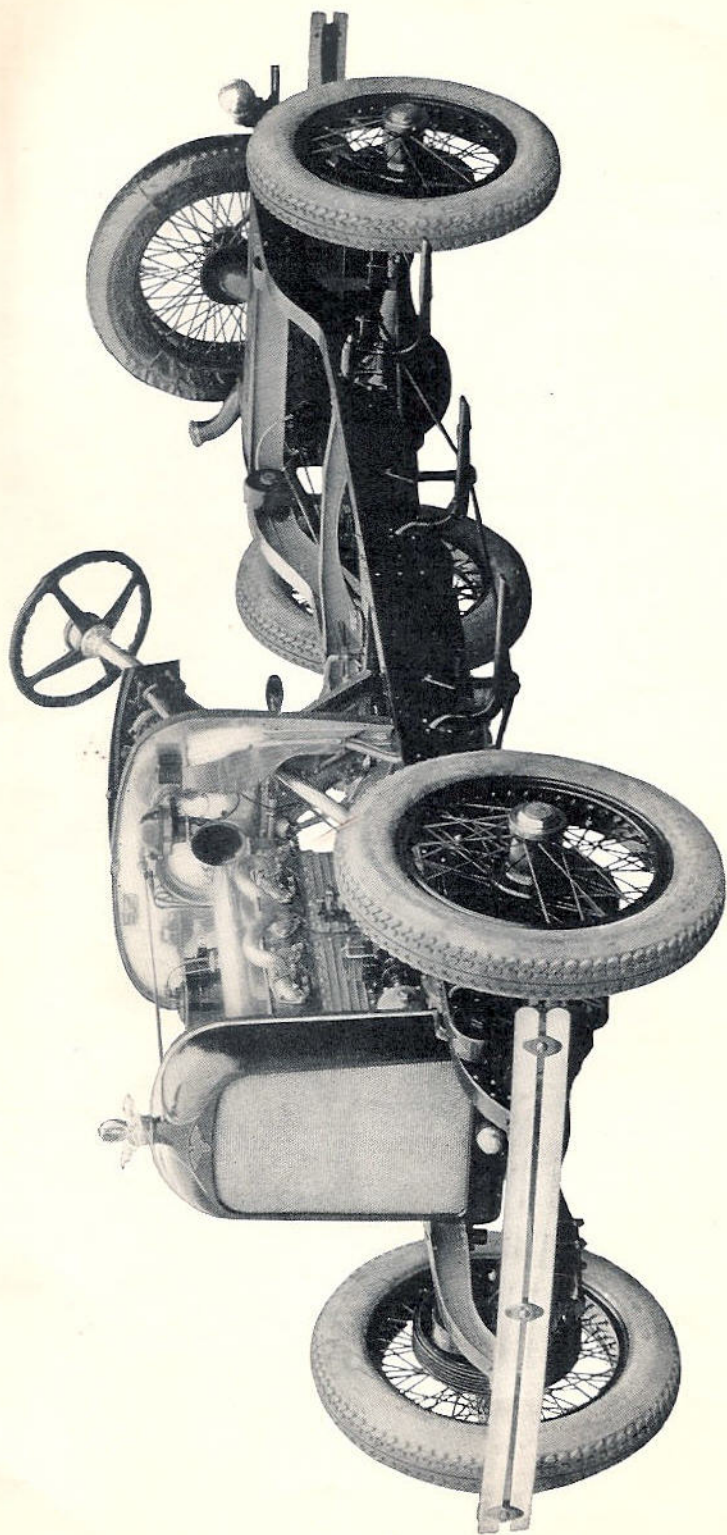
This edge of steel to line  
up with center of slot  
with slack taken up  
as indicated by arrow  
and the fly wheel set  
dead center  
on the  
compression stroke  
of the number one  
piston

The Original Straight-Eight...  
Pioneers of Four Wheel Brakes

Duesenberg Motors Company

Indianapolis, Ind.

U. S. A.



View showing clean lines of Duesenberg Straight Eight



## Foreword



IN sponsoring a passenger car, Duesenberg has realized to the full its purpose of preserving in an automobile of utmost gentility and irreproachable good taste, the highly desirable attributes of victorious racing design—indomitable ruggedness to minimize the need for attention—power without practical limitation—a degree of safety beyond the remotest necessity.

All this implies advanced engineering, modern facilities and an organization of skilled artisans capable of producing an automobile of unmatched endurance.

Nevertheless, like any other fine piece of mechanism, intelligent care and attention is necessary if the owner is to profit by the painstaking effort the maker has taken to give him a car of unqualified worth, that it may continue to render the service it is capable of, undiminished, with unflinching regularity.

This becomes particularly pertinent when applied to the matter of lubrication, the neglect of which may mean uncalled for expense, if not more serious consequences.

In keeping, therefore, with our appreciation of the intrinsic value to the Duesenberg owner of correct lubrication and for his profitable guidance, we respectfully submit the following suggestions.

Duesenberg Motors Company,  
Indianapolis, Ind., U. S. A.



set intake valves 6,000. in 7 inch.  
" exhaust " 8,000. in 7 inch.

## Description of Duesenberg "Straight Eight" Engine

{Same Body &  
Pender Co.}

### Specifications:

Bore  $2\frac{7}{8}$  inches  
Stroke 5 inches  
Cylinders cast in block  
Displacement 260 cubic inches  
S. A. E. rating 26.45 HP.  
Aluminum alloy pistons  
Valves in head  
Overhead camshaft

{Brake fluid.  
60% Glycerin  
40% Alcohol}

One piece counter-balanced crankshaft in accurate static and dynamic balance, supported by three large bearings.

Water circulated by centrifugal pump.

### Lubricating System

A force feed lubricating system is employed. (See Figs. 1 & 2). A gear pump, located beneath the front end of the crankshaft and driven by it, draws oil from the reservoir in lower half of crankcase and delivers it under pressure through suitable piping to the three main bearings.

After lubricating these, it passes on, through drilled holes in the interior of the crankshaft—entering through a radial hole in the crankshaft journal and leaving through a similar hole in the crank-pin journal—to the connecting rod bearings. The surplus oil continues on and out of each end of the connecting rod bearing where it is acted upon by centrifugal force (due to the rotation of the crankshaft) and whipped up into a fine mist, or spray, lubricating cylinder walls, pistons, and all other friction surfaces within the engine.

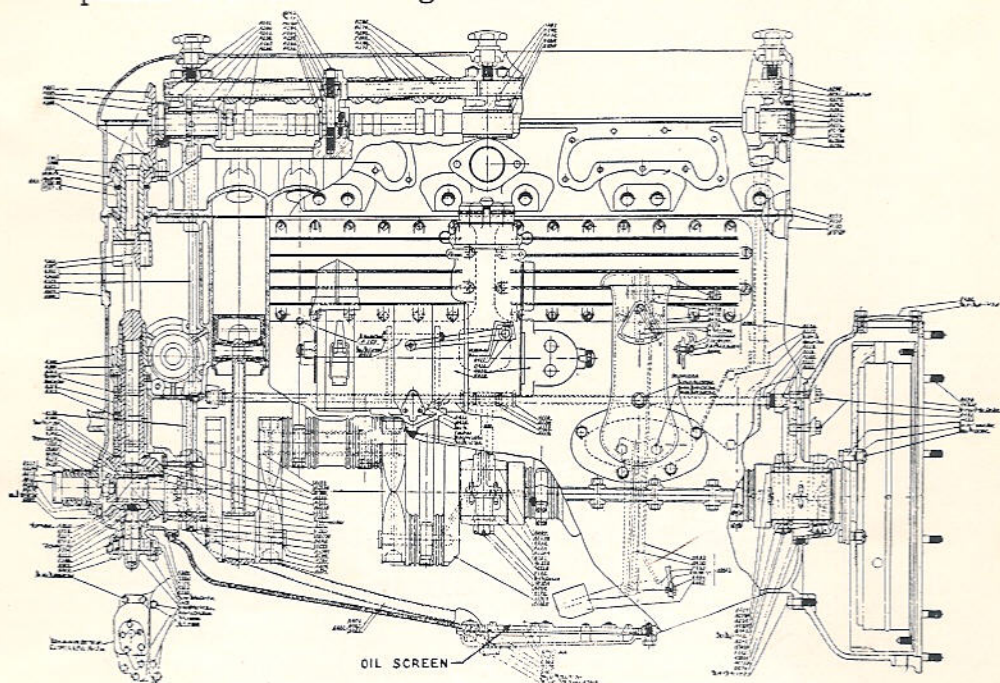
Another line leads the oil, from the pump, up through the forward end of the cylinder block into the head, thence to the front bearing of the camshaft. The latter is hollow and radial holes supply each of the camshaft bearings with oil under pressure. Another lead from the same source, in the front bearing of the camshaft, permits oil to reach the inside of the rocker arm tube, or shaft, which is also drilled radially, to feed each of the rocker arm bearings with oil under pressure.

Excess oil leaving the camshaft and rocker shaft bearings drains into a trough, lubricating the cams and rocker arm rollers by a bath of oil. Valve stems are lubricated by the spray resulting from the action of the moving parts on the oil.



## LUBRICATION INSTRUCTIONS

From the trough it drains into the head and back into the crankcase through two sources—at the forward end it passes over the bevel gears on the hollow vertical drive



Longitudinal Section of Engine  
Figure 1

shaft and on down through the tube, and at the rear end down through a tube provided for the purpose.

A by-pass or pressure regulating valve is located at the forward end of the head, under the cover, at the right side of the front camshaft bearing. It serves the purpose of (1) controlling the amount of oil reaching the bearings and, ultimately, the cylinder walls and combustion chambers, by diverting a quantity of the pump discharge (depending on the spring pressure holding the check valve to its seat) away from the bearings back to the reservoir, and (2) limits the maximum pressure in the oil line.

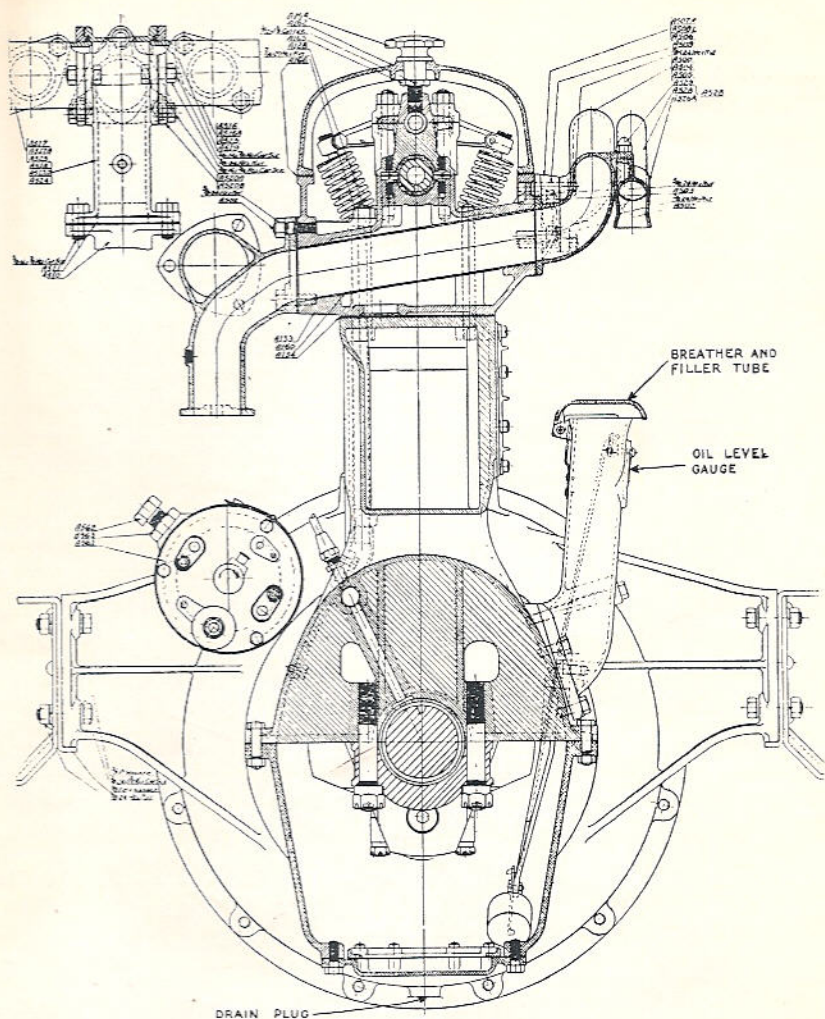
### LUBRICATION OF ENGINE

#### *The Essentials of Correct Lubrication*

To correctly lubricate an engine it is not only essential that the oil be of highest quality, but it must be of the proper body and character to meet the operating conditions with scientific exactness. To satisfy all the conditions met with in service it must be intelligently selected



## LUBRICATION INSTRUCTIONS



Transverse Section of Engine  
Figure 2

and properly used, so that the proper amount of oil in good condition is delivered to all friction surfaces at all times. Unless these conditions are consistently fulfilled the neglect will quickly be apparent in interrupted service and costly repairs. It is a known fact that incorrect lubrication is responsible for more than 50% of the expensive repairs and costly interruptions encountered in service.

### *Determining the Correct Lubricant*

The selection of the correct grade and character of oil for an automotive engine is a problem requiring care-

ful study by competent engineers, familiar with the design and construction of automotive units, as well as the performance of lubricants under the various conditions of service encountered.

The selection of the correct grade of oil depends upon the consideration of four basic lubrication factors in connection with the design and operation of the engine, operating temperature, distribution, carbon sensitiveness and piston seal.

Engine operating temperatures are affected principally by the service the engine performs, the type of cooling system, kind of fuel employed, the engine speed and the size of the cylinder bore.

To make sure that the oil which satisfactorily meets the temperature conditions will be properly distributed, it is necessary to thoroughly analyze the lubricating system, as the selection of the oil to ensure proper distribution to the various parts requiring lubrication is governed largely by the design of the system. Some lubricating systems are adapted for perfect circulation of all oils from the heaviest bodied to the lightest; others function best on oil of light or medium body. As the proper functioning of the lubricating system depends entirely upon the correct oil being used, the correct oil must be of such body as to be perfectly circulated and distributed to the frictional surfaces of the engine by the system under practically any temperature encountered in service.

The lubricant which is correct for both operating temperatures and the lubricating system must be of such character as to minimize carbon formation and at the same time seal the piston rings against the highly compressed gases on the compression and power strokes.

### *LUBRICANT RECOMMENDED*

#### *Summer*

To satisfactorily meet the conditions of operation and design referred to in the foregoing paragraphs we recommend the use of a high grade heavy medium bodied oil such as Gargoyle Mobiloil "A" for use during the warm months of the year.

#### *Winter*

When freezing temperatures are expected, a somewhat more fluid oil, such as Gargoyle Mobiloil Arctic, is desirable to



facilitate starting and assure prompt circulation throughout the system immediately thereafter.

### DETAILED INSTRUCTIONS

*for*

### ENGINE LUBRICATION

#### *Filling*

The oil filler and oil level indicator (gauge) is located on the generator side of the engine.

Fill the reservoir with 6 quarts of oil, and add a sufficient amount as required to keep the level well above the "half full" mark on the gauge.

#### *Caution*

Do not overfill the crankcase, as too much oil will bring the level high enough for the connecting rods to dip, thus causing excessive quantities of oil to be thrown onto the cylinder walls, resulting in oil pumping, smoking, excessive carbon deposits and fouled spark plugs.

Never operate the engine with the filler cap in the open position as the breathing action of the motor will draw dust and grit into the engine, which, when mixed with the oil, forms an abrasive resulting in rapid wear of the cylinder walls, piston rings and bearings.

### OIL PRESSURE

At 30 miles per hour the oil pressure gauge on the dash should register about 30 pounds pressure with the engine warmed up, when the recommended oil is used. In starting, the pressure will be somewhat higher due to the chilled condition of the oil.

The failure of the oil gauge to show the required pressure may be due to the following causes:

1. Use of an oil too light in body (follow recommendations in this book).
2. Oil excessively diluted with fuel (follow instructions for draining crankcase).

3. Worn or loose fitting bearings, particularly end play. (Replace bearings).
4. A leaky or broken oil tube (tighten connections, replace tubes if necessary).
5. Clogged oil screen (follow instructions for cleaning).
6. By-pass valve improperly adjusted (follow instructions for adjusting).
7. Broken oil gauge (have new one installed).

### *TO ADJUST OIL PRESSURE*

Adjustment of the oil pressure regulator, is very rarely required. Reduction of pressure is usually due to one of the preceding causes. When loss of pressure has been caused by too much clearance in the connecting rod bearings it is obvious that the cylinders are already getting more than the normal oil supply, and any increase of pressure will result in over-oiling. The causes of reduced pressure should always be checked before changing the regulator.

If, however, it becomes necessary to increase the pressure by the regulator it may be done by loosening the lock nut and adjusting the valve spring pressure by turning the slotted screw with a screw driver. Turning it to the RIGHT (clock-wise) increases the pressure and to the LEFT (anti-clockwise) decreases the pressure in the line, as shown by the gauge on the dash.

**WHEN THERE IS NO OIL PRESSURE ON STARTING, STOP ENGINE IMMEDIATELY** and look for:

1. No oil in reservoir. Replenish supply.
2. Oil excessively diluted with fuel. Follow instructions for draining and refilling crankcase.
3. Clogged oil screen. Follow instructions for cleaning.
4. Broken oil line. Inspect for leaks.
5. Clogged oil tube leading to gauge. Test for clogging. Open connection at engine and turn engine over slowly. If the trouble is due to a clogged pipe a stream of oil will come from open



connection. Remove the pipe and blow it out with compressed air.

6. Broken pumpshaft (this is always due to negligence on the part of the operator in not draining the crankcase at frequent intervals in winter. (See paragraphs on sludge formation, page 16).

### *DRAINING CRANKCASE OIL*

Periodic draining of the oil reservoir is one of the most important factors in reducing wear and maintaining maximum efficiency of the engine.

Even the best of oil deteriorates in service. Its lubricating value is not actually destroyed, but the oil becomes thinned with fuel absorbed by the oil film on the cylinder walls, and which is scraped back by the piston rings and mixed with the crankcase oil. This dilution is of course, greatly increased when the choke is used excessively or when the carburetor is adjusted for an over-rich mixture. The dilution by fuel is most rapid on new engines and when the engine is operated in cold weather without some provision being made to ensure the proper operating temperatures.

The crankcase oil also becomes further contaminated with road dust drawn through the carburetor, particles of worn metal and by carbon particles. Due to the wearing-in period of all friction surfaces, the accumulation of worn metal particles is greatest in a new engine.

During cold weather, unless the engine is kept warm by partial covering of the radiator, water is likely to accumulate in the crankcase. This is due to condensation of the steam which is always present in the gases that blow past the rings when the oil becomes diluted by cold operation of the engine, the steam being one of the products of combustion of the fuel. With dirty oil this water may form sludge or emulsion which is likely to clog the oil screen and passages. In order to avoid trouble from this source, the following procedure should be adhered to.

**DRAIN THE CRANKCASE OIL** after the first 500 miles of service of a new engine and every 1000 miles in summer and every 500 miles thereafter in winter. To do this, remove the crankcase drain plug which is directly under the oil screen (Figure 1). The best time to drain the oil is after a run while the engine is still hot. The oil



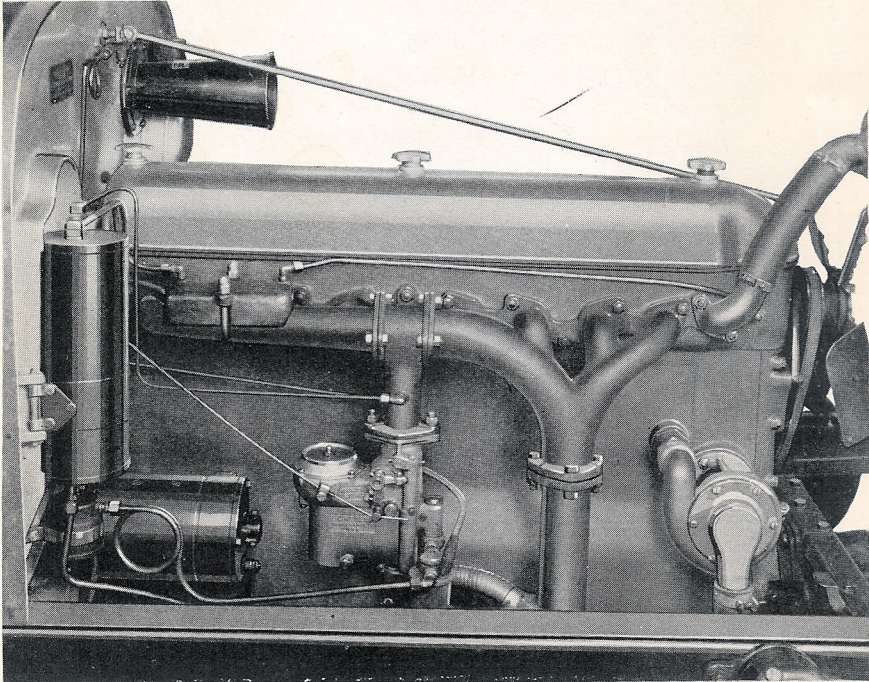
is then more fluid and thoroughly agitated and, therefore, will carry off most of the sediment.

### *DO NOT FLUSH WITH KEROSENE*

When kerosene is used to flush out a lubricating system, a large percentage of it will remain in the system, regardless of how much care is taken to remove it. When fresh oil is added, this kerosene will dilute it considerably and greatly reduce its lubricating value.

After draining, replace the plug. Instead of using kerosene, it is preferable to put a quart or two of fresh oil into the crankcase and turn the engine over several times to wash out the system. Remove the plug and drain again.

Finally refill crankcase with 6 quarts of fresh oil of the correct grade.



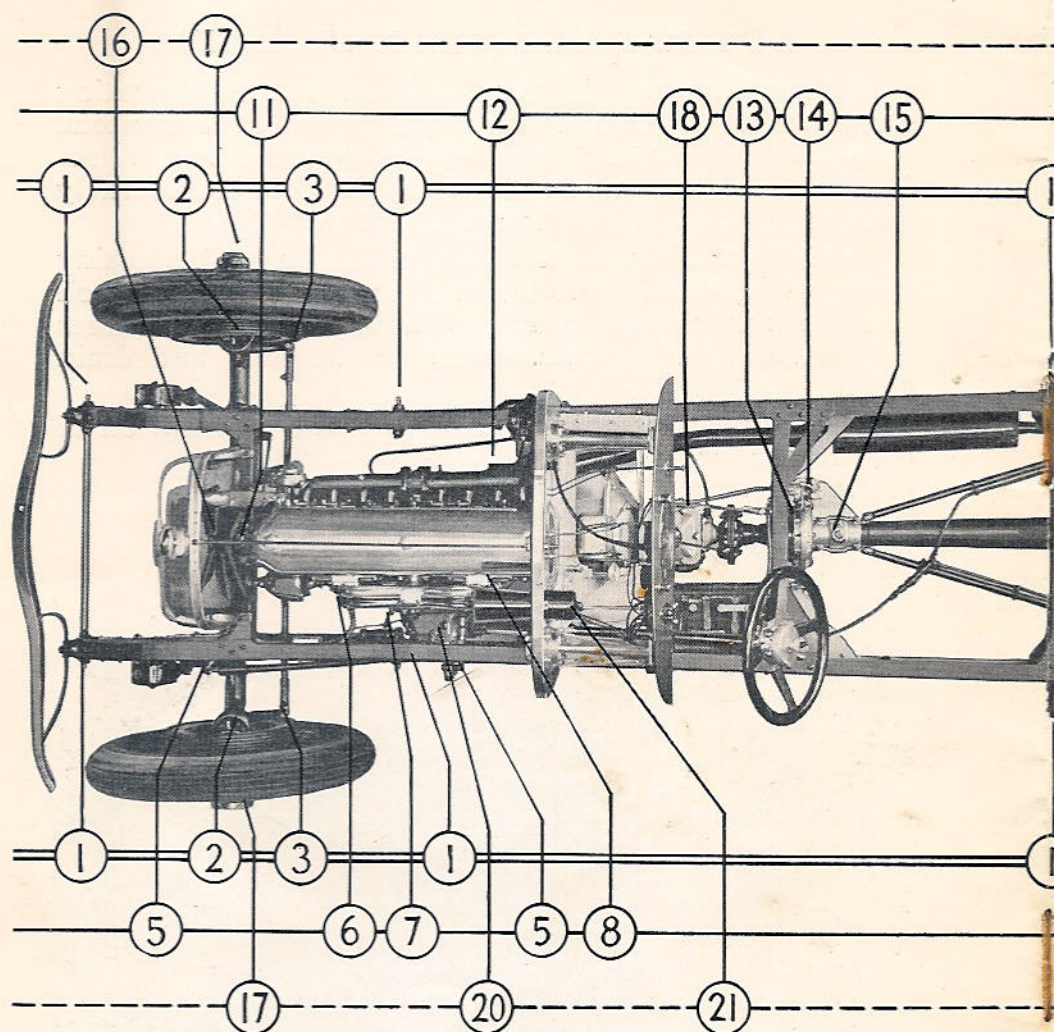
Side View of Engine  
Figure 3

### *TO CLEAN THE OIL SCREEN*

At least every 1000 miles the oil screen should be cleaned so as to prevent stoppage of the oil flow. To do



# DUESEN LUBRICATION



- 1 Spring & Shackle Bolts
- 2 Steering Knuckle Pivots
- 3 Tie Rod Bolts
- 5 Steering-Gear Connecting Rod (Drag-Link)
- 6 Generator
- 7 Spark & Throttle Ball Joints

- 8 Engine-Crankcase Re
- 10 Rear Spring
- 11 Engine Front
- 12 Starting Mot
- 13 Torque Yoke
- 14 Hand Brake

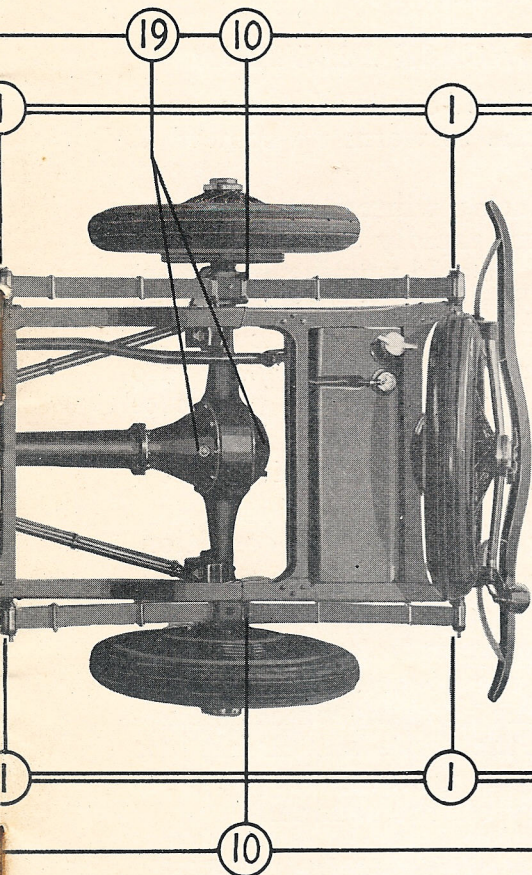


# BERG ON CHART

Every Two Months or 2000 Miles

Every Month or 1000 Miles

Every Week or 250 Miles



See Text for  
More Complete  
Instructions.

Every Week or 250 Miles

Every Month or 1000 Miles

Every Two Months or 2000 Miles

Reservoir  
Saddles  
Support

or

Pivot Pins  
Connections

- 15 Torque Yoke Cap
- 16 Fan Hub Filling Plug
- 17 Front Wheel Bearings
- 18 Transmission (Filling & Level Plug)
- 19 Differential (Filling & Level Plug)
- 20 Steering Gear Housing (Filling Plug)
- 21 Horn



this, it is only necessary to remove the plate on the bottom of the oil pan when the screen may be taken out. Wash with kerosene or gasoline and dry with compressed air or a lintless cloth. Do not use waste. A few strands of hair or lint will quickly block a screen.

### *HOW TO AVOID CRANKCASE DILUTION*

1. Avoid excessive use of the "choke". After starting give the engine time to warm up somewhat before driving.
2. Use a radiator cover during winter to allow your engine to warm up more rapidly and also to run at a high temperature. A cold running motor acquires dilution much more rapidly than a hot one because all the fuel injected into the cylinders does not vaporize. Some of it finds its way into the oil pan. Heat aids vaporization and promotes perfect combustion.
3. Avoid idling for long periods or excessively slow driving.
4. Keep your engine in good mechanical condition.
5. Drain the crankcase frequently, at least as often as specified elsewhere in this book.
6. Do not flush the crankcase with kerosene. It is impossible to drain all the pockets without dropping the oil pan—and the kerosene which is trapped remains to dilute the fresh oil. Drain the crankcase while the engine is warm and the oil is agitated—this will carry off the sediment.

### *HOW TO AVOID OIL PUMPING AND CARBON DEPOSIT*

"Oil pumping," in the common use of the term, refers to the accumulation of oil in the combustion chamber rather than to the quantity which actually passes the pistons. With adequate cylinder lubrication, there is normally a certain quantity of oil passing into the combustion chamber. If it is burned, its presence is not objectionable—but if it accumulates, fouled spark plugs, sticky valves and excessive carbon deposits are likely to result.

An engine operating under a fairly heavy load will burn up cleanly even an excess of oil, while one which is



lightly loaded or running idle cannot consume large quantities of oil, particularly if the lubricant is richer than the operating temperatures call for. The result is oil pumping troubles which are always aggravated when an oil heavier than recommended is used.

Wear of cylinders and pistons which has increased the normal clearance, or wear of the piston rings may be responsible for an excess of oil in the combustion chamber. Wear of the rings in their grooves will cause a definite pumping action—lifting the oil mechanically into the combustion chamber. When wear occurs, it must be remedied by renewing or refitting the parts affected. With correct lubrication, wear of this nature will be greatly reduced.

Carbon accumulation in the engine is the result of incomplete combustion—either of the oil or of the fuel or both. This failure to burn the oil and fuel completely may be due to the lack of sufficient air for complete combustion or to the lack of sufficient heat for proper vaporization.

Oil pumping and excessive carbon deposits may be controlled by careful observation of the following suggestions:

1. Fill the crankcase carefully to its proper level daily. Do not over-fill. Over-filling may cause over-oiling with consequent oil pumping and carbon formation.
2. Use a high quality oil of the body and character recommended in this book. Either an incorrect grade or a poor quality oil may make trouble.
3. Do not try to compensate for wear by using a heavier bodied oil than has been recommended. The heavy oil when heated will pass the pistons almost as readily and will be harder to burn. The trouble will therefore be aggravated instead of corrected.
4. If the oil pressure falls off gradually, with this oiling system, a probable cause is worn bearings, which allow too much oil to be sprayed from the bearing clearances to the cylinder walls. If this is the case, it is obviously wrong to try to correct the condition by increasing the pressure and feeding still more oil, or by changing to oil of a heavier grade. If the oil pressure is not what it should be, an investigation should be made by a competent service man. Oil diluted by fuel will also cause a falling off in the oil pressure. It is therefore advisable to drain



the crankcase completely and refill with fresh oil before concluding that the bearings are at fault.

5. Be sure that the carburetor is not feeding too rich a mixture. If there is not enough air to consume all the fuel, there certainly will not be enough to consume any excess oil which passes into the combustion chamber. Incomplete combustion means carbon.

6. "Missing" promotes oil pumping and carbon formation because the oil normally passing into the combustion chamber is not burned. Keep the ignition system in good condition and do not use the engine as a brake on long hills with the switch off.

7. Compression losses affect the efficiency of the engine and the complete combustion of oil and fuel. Keep the valves properly ground in—the tappets properly adjusted—and the cylinder head gaskets tight.

### *HOW TO AVOID SLUDGE FORMATION*

"Sludge", as already stated, is an emulsion of oil, water and impurities which accumulates most frequently in engines run too cold. Water vapor constitutes a large percentage of the exhaust gas in normal combustion. Unless the piston sealing is absolutely perfect, a small portion of this burned gas passes into the crankcase. If the crankcase is kept normally hot, the water vapor will pass off through the breather without condensing. In a cold crankcase, it will condense. The water may settle to the bottom of the case or may be continually circulated and mixed with the oil. In either case, sludge is apt to form from the agitation of the fuel and water, together with the impurities which are always found in the crankcase. In winter this difficulty is aggravated from the fact that crankcase temperatures are lower and condensation is more rapid. The danger is increased from the fact that the condensed water may freeze and completely stop the oil circulation.

If the water has not been thoroughly mixed with the oil, this freezing may be localized at the low point in the crankcase. If there is a sufficient quantity, the oil circulation may be blocked with ice. If the water is kept in constant agitation, it may freeze in crystalline form throughout the whole body of the oil, with the apparent result of thickening the oil so that it will not circulate. The oil



screen may strain out an accumulation of this snow or ice deposit so that circulation will be completely stopped.

This difficulty is most evident at extremely low temperatures and can only be avoided by the use of adequate means to keep the engine and crankcase normally warm.

Sludge formation can be controlled by careful attention to the following details:

1. Drain the oil at specified intervals—or oftener if the service consists of short intermittent runs in which the engine does not reach its normal operating temperatures. This will prevent the accumulation of too much water.
2. Use a suitable radiator cover or shield in winter. By keeping the engine normally warm the condensation of water vapor in the crankcase will be avoided.
3. Clean the oil screen at least as often as specified on page 11.
4. If the oil shows signs of thickening when the crankcase is drained, remove the oil pan and clean it thoroughly with a lintless cloth. All trace of sludge should be removed as its presence will start new formations.

### *HOW TO PREVENT RUST AND CORROSION TROUBLES*

Occasionally some of the polished parts of engines, such as the piston pins and valve stems, are found to be rusted or corroded. This trouble is due, first, to the presence of water in the crankcase and, second, to the fact that badly diluted oil does not protect the working parts from the rusting action of the moisture. If this moisture is made acid, as it can be through the use of fuels containing excessive amounts of sulphur, the surfaces may become corroded very rapidly.

Any sulphur which is contained in the fuel burns in the cylinders and forms sulphur trioxide ( $\text{SO}_3$ ). If there is leakage past the pistons and rings, part of this sulphur trioxide will find its way into the crankcase along with a considerable quantity of water vapor, one of the products of combustion. After the engine is cold, this water vapor will condense into liquid form and unite with the sulphur trioxide to form sulphuric acid ( $\text{H}_2\text{SO}_4$ ). If the crankcase oil is badly diluted, it will drain off of the parts, leaving



them exposed to the action of this acidulated moisture which of course tends to corrode them. Even if the fuel is free from sulphur compounds which would form acid the parts may rust due to their becoming coated with moisture.

Rusting and corrosion troubles may be avoided by observing the following precautions:

1. Keep the engine warm so that excessive dilution will not take place or water collect in the crankcase. There can be no rusting or acid formation without water, or corrosive action if the parts are protected by oil.
2. Keep the engine in such mechanical condition that the burning gases will not readily pass the pistons and rings.
3. Use the correct oil and keep it in good condition so that the pistons will be sealed against leakage.
4. Follow the draining suggestions given in the section "Draining Crankcase Oil".
5. When storing your car for a prolonged period drain the engine crankcase, refill it with fresh oil and run the engine only long enough to assure thorough distribution of the fresh oil to every working part.

### *OPERATING A NEW ENGINE*

Under no circumstances should you drive your car more than 25 miles per hour during the first 1,000 miles or more. The object of this is self-evident. By driving the car slowly and thus preventing the over-heating of any parts, all the wearing surfaces become glazed and smooth. After this period of slow operation, provided proper lubrication has been maintained, high speeds can be attained for long periods without danger of injury to any of the wearing surfaces.

### *OPERATING AN ENGINE EQUIPPED WITH MAGNALITE PISTONS*

Cars equipped with magnalite pistons which are properly fitted for operating under normal temperature conditions must be handled with reasonable care. The engine should be warmed up gradually and not be subjected to sudden bursts of speed after it has been standing.



This is readily explained if you will consider the difference in characteristics of the metals used in the cylinders and the pistons. The cast iron has only about one-third the expansion of aluminum alloys such as magnalite. It absorbs heat only about one-third as fast as magnalite. The temperature of the cylinders can only be brought up to operating level by the heat of the explosions in the combustion chamber. The amount of metal in the cylinders which has to be warmed up in this manner is around 200 lbs. The weight of the pistons about 8 lbs. Both are exposed to the same heat conditions and it is obvious that the same amount of heat applied to the 8 lbs. of magnalite pistons with their greater conductivity and expansion will cause them to enlarge much more rapidly than the cylinders and as a result it is possible to start any motor with magnalite or aluminum alloy pistons after it has been standing and by rapid acceleration stick the pistons badly enough to injure some of the vital parts of the engine as well as the cylinders and pistons themselves.

On the other hand, if the engine is gradually brought up to temperature and not forced at high speed until it is warmed up there is no liability whatsoever of damage either to the engine parts, the cylinders or pistons.

### *CLUTCH THROW-OUT BEARING*

This bearing is lubricated by the oil from the transmission which reaches it through a channel drilled in the center of the clutch shaft, communicating in turn, with a hole drilled radially and in line with the bearing. No attention is necessary other than to maintain the lubricant in the transmission case at its proper level.

If clutch acts erratic, plug up bottom hole with wood plug and pour in a half and half mixture of light engine oil and kerosene. Block out clutch and crank engine over several times to allow the mixture to penetrate the clutch surfaces, then drain.

### *TRANSMISSION*

Like the motor and other working units of the car, the transmission should be carefully "broken in" if maximum service is to be obtained. Using the gear frequently under light loads while the car is new will polish the teeth, bearings, shafts, and bushings to perfect surfaces; whereas, abusive use of the transmission before these parts are



properly worn in, will damage them in such a way that they will not wear to the smooth-running fit.

It is very essential that the proper lubricant be used in the transmission. We recommend a heavy bodied gear oil, such as Mobiloil "C", for this work. Grease or light oils should never be used as the former not only will not lubricate, but will stop up the oil passages, while the latter will not properly cushion the gear teeth to prevent wear and noise. Cheap oils or "soap-oil" mixtures should not be used.

The transmission should be filled through the plug opening (Fig. 4) on the left hand side, to the edge of this opening. This level should be tested every 1,000 miles and the supply replenished if low.

After the first 500 miles of service, the transmission should be drained by removing the plug at the bottom of the case, flushed out with kerosene or light engine oil and refilled with fresh lubricant. This should then be repeated every six months or after every 5,000 miles of service.

### *DIFFERENTIAL*

A semi-floating rear axle is employed. The differential is carried by two ball bearings on either side and held in place by two caps.

Inside the split differential case is a four armed spider carrying a small bevel gear on each arm—the four gears engaging the two side gears which drive the two axle shafts. The outer ends of the latter terminate in and are a part of the wheel hubs.

The bevel-drive (ring) gear is riveted to a flange on the differential case and is driven by a pinion whose shaft is supported by two double row ball bearings.

Lubrication is supplied by a pool of oil in the axle housing in which the lower teeth of the ring gear is submerged.

We recommend the use of high grade gear oil, of the body and character of Gargoyle Mobiloil C, for this purpose.

**TO FILL:** Two plugged openings are provided—one on top of the carrier housing and another in the back cover plate. (See Fig. 5).



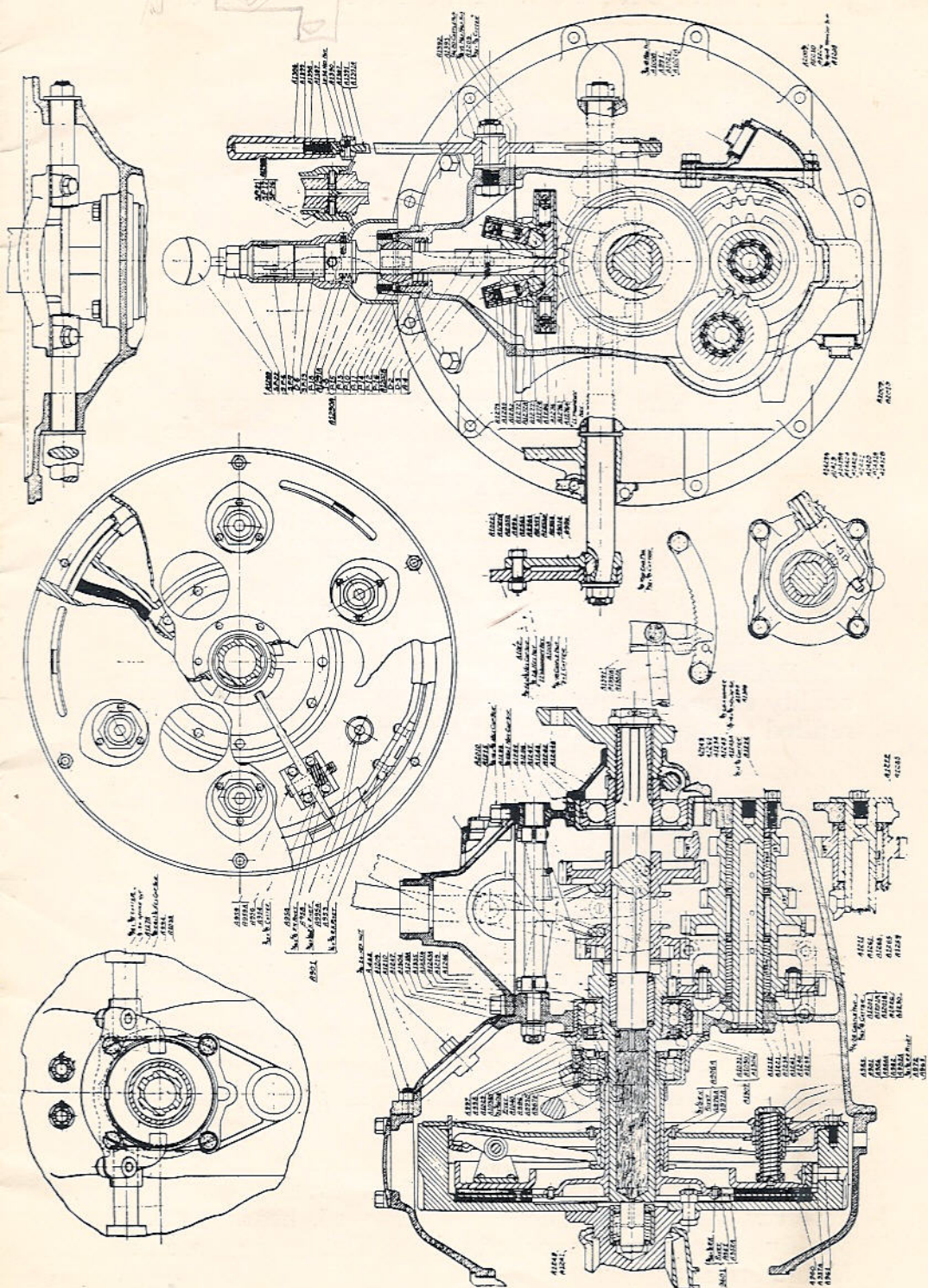
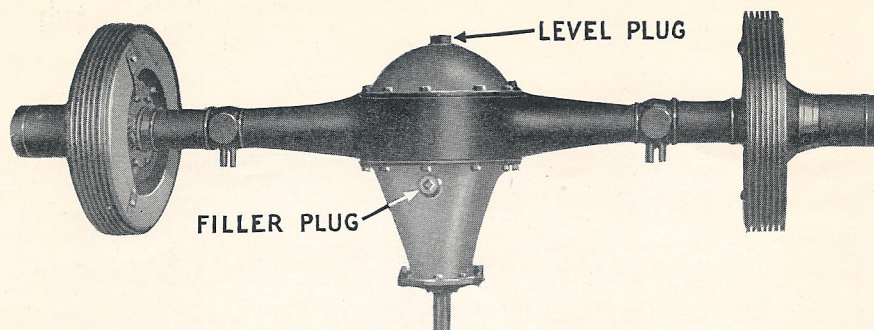


Figure 4. Details of Transmission and Clutch





View of Rear Axle  
Figure 5

The latter is intended to serve as a level testing plug but may also be utilized to fill the housing if a garage pump and tank is available. Otherwise, fill through the plug opening on top of carrier housing until oil is just ready to run out of plug opening in back cover plate.

Do not overfill. Overfilling will cause leakage on brake drums with resultant brake slippage.

Every 5000 miles the housing should be drained, thoroughly cleaned out with kerosene or light engine oil and refilled to the proper level. Replace plugs.

### *WHEEL BEARINGS*

Every 2000 miles the lubricant in the front wheel hub caps should be replenished with a good grade of cup grease, such as Mobilubricant.

Every 5000 miles the front wheels should be removed, bearings thoroughly cleaned and repacked with Mobilubricant or other high grade grease of similar consistency.

Caution:—See that wheel bearings have the proper amount of play when adjusting bearings. Wheels should turn freely without excessive shake. Replace locking device securely.

Lubrication of the rear wheel bearings is provided for by the lubricant from the axle housing. Every 5,000 miles, however, the wheels should be removed, bearings thoroughly cleaned and repacked with a high grease, such as Mobilubricant.



### *WHEEL HUBS*

Every 2000 miles the wire wheels should be removed and hubs greased with Mobilubricant. This will prevent corrosion with its resultant difficulty in changing wheels and tires.

### *STEERING GEAR HOUSING*

At least every two months, or two thousand miles, the steering gear housing, at the foot of the steering column, should have its lubricant replenished. Fill slowly with a semi-fluid lubricant, such as Mobiloil "CC", through plug opening.

### *FAN*

The air circulating fan is located at the front of the engine and draws air through the radiator to cool the latter more rapidly.

To lubricate, remove slotted screw plug and fill slowly with a semi-fluid lubricant such as Gargoyle Mobiloil "CC". Replace plug to prevent leakage of lubricant. This should be done at least every 2000 miles.

### *UNIVERSAL JOINTS*

Only one joint is required with the torque tube construction used on the Duesenberg car. The necessary flexibility is provided by rubberized fabric and does not require lubrication.

### *ELECTRICAL UNITS*

The generator and starting motor are equipped with small oil cups which should be given a few drops of engine oil once a month or every 1000 miles. More oil than this is unnecessary and may cause trouble. They should, however, receive regular attention to make them perform in the consistent way of which they are capable.

### *LUBRICATION WITH HIGH PRESSURE OIL GUN*

All high pressure fittings should be lubricated with a semi-fluid lubricant such as Gargoyle Mobiloil "CC". These include the following:



## LUBRICATION INSTRUCTIONS

WEEKLY OR  
EVERY 250  
MILES

Steering Knuckle pivot pins  
Tie rod bolts  
Steering gear connecting rod (drag  
link)  
Spring and shackle bolts

MONTHLY OR  
EVERY 1000  
MILES

Rear spring saddles  
Front engine support  
Torque yoke pivot pins  
Torque yoke cap

### *BRAKE CLEVIS PINS*

Every 5000 miles the wheel brake drum covers should be removed and the pins lubricated with penetrating oil. Clevis pins on master cylinder should also be lubricated in the same manner.

### *DISTRIBUTOR*

Every 2000 miles, the lubricant in the distributor gear housing should be replenished with a high grade cup grease, such as Mobilubricant.

### *MISCELLANEOUS PARTS*

Brake connections, pedal and clutch shafts, spark and throttle ball joints, steering column, etc., should get a few drops of engine oil every 1000 miles with hand oil can. The horn rotor should be given similar treatment every 2000 miles through the two holes provided for the purpose.



Prepared by the  
VACUUM OIL COMPANY, NEW YORK, N. Y., U. S. A.

In collaboration with the  
DUESENBERG MOTORS COMPANY,  
Indianapolis, Ind., U. S. A.

Printed in U. S. A.

MD 2598





# Out of the CRUCIBLE

This very scarce and very interesting 1924  
DUESENBERG booklet has been reprinted  
for racing and classic car enthusiasts by

**JACK CARMODY**

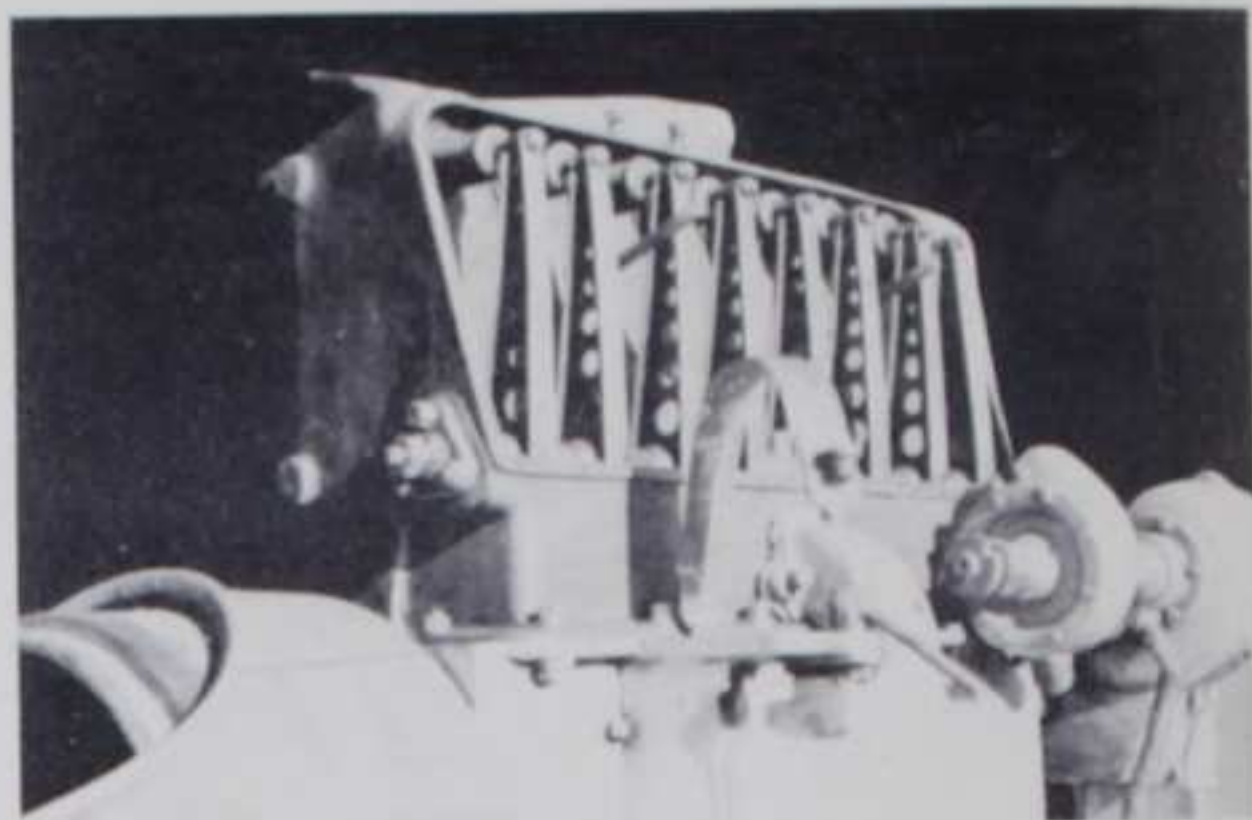
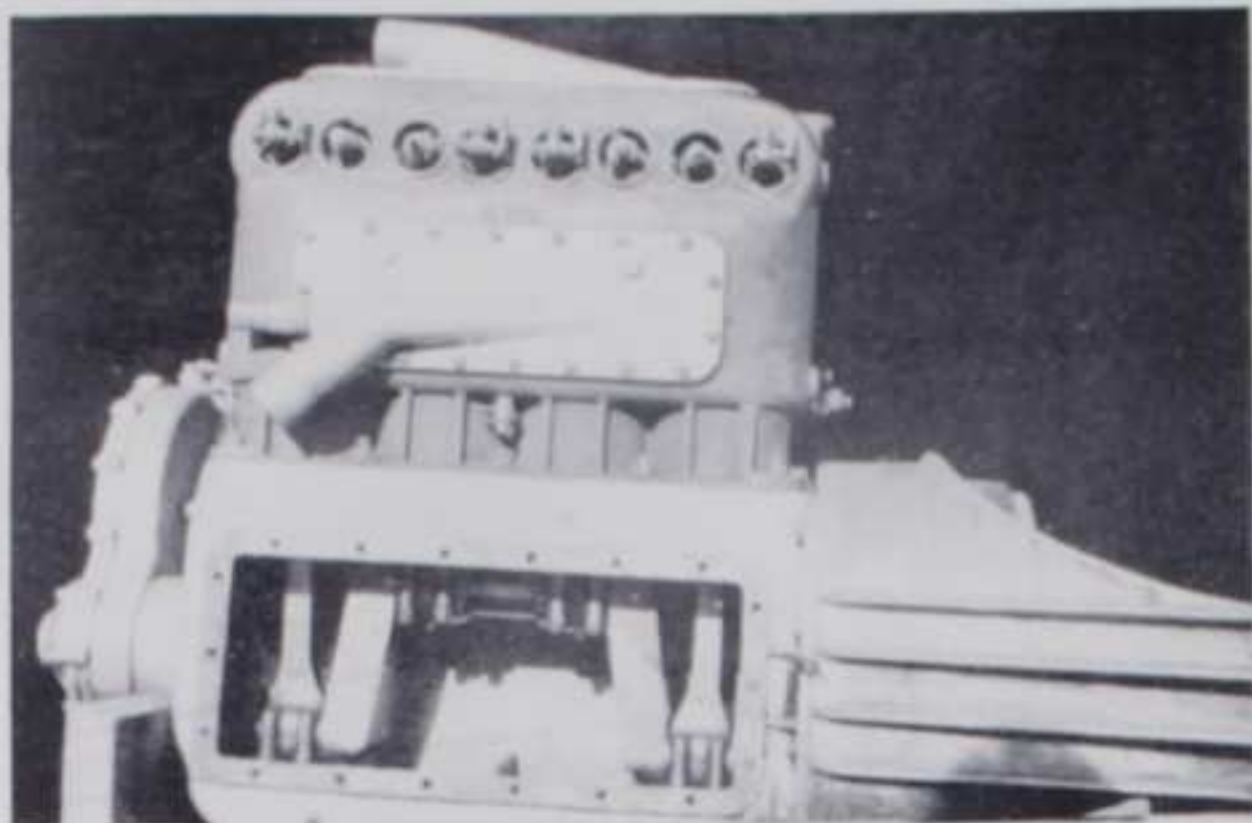
542 ROCKDALE DRIVE  
SAN FRANCISCO 27, CALIF.

Supplementary text and photos added  
to the inside front and back covers.

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1953





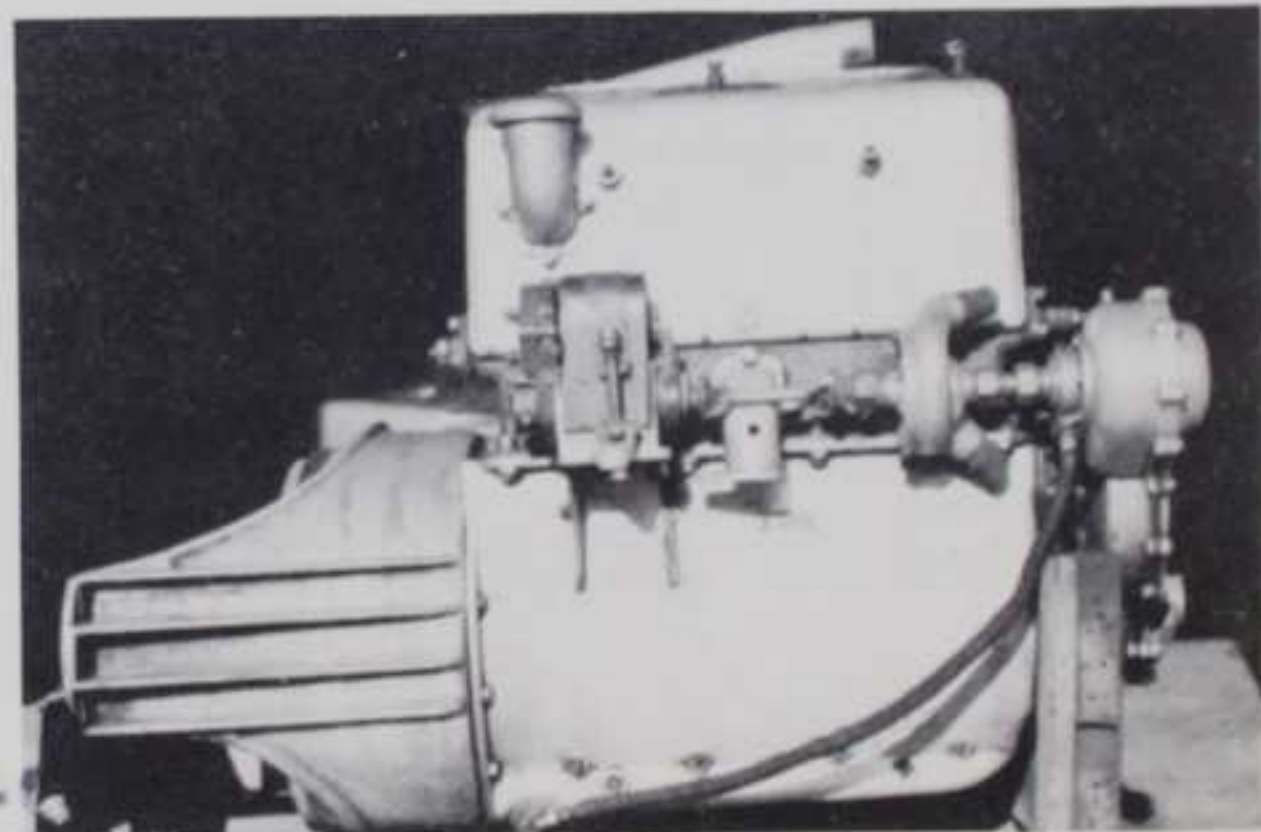
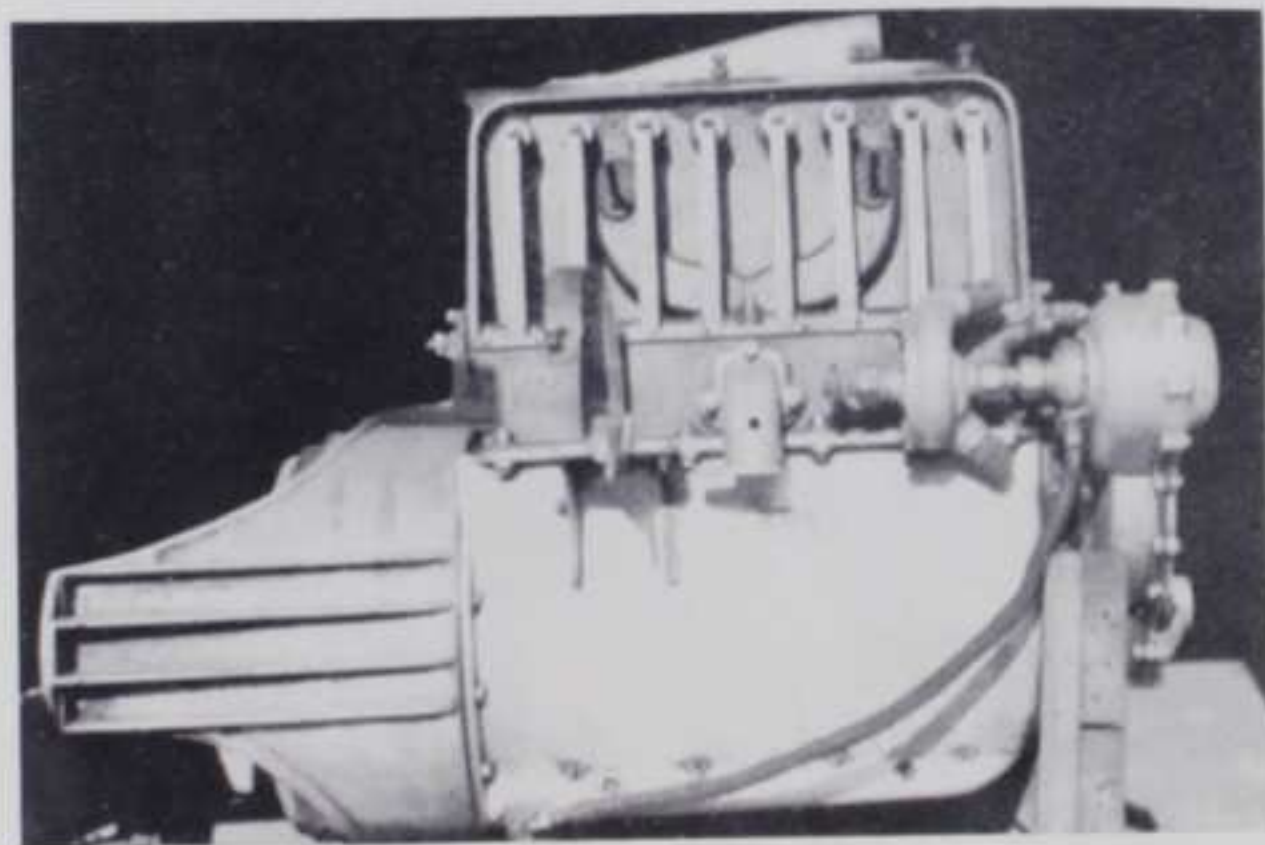
300 cu. in. racing engine—1915

**D**UESENBERG's Indianapolis race victory in 1924 (again in 1925 and 1927) climaxed many years of racing. The 1912-13 models—known as the Mason, after Fred Duesenberg's early financial backer—were somewhat unusual in that Duesenberg had such faith in his design that he remained considerably below the generous piston displacement limits of those years. With the advent of the 300 cu. in. class in 1915, however, Duesenberg adhered to previous design but nudged the limit with 299 cu. in. obtained from four cylinders of 3.98" bore and 6" stroke. The iron block and head were integral, bolted to an aluminum crankcase. Valves were above the pistons but worked horizontally from huge vertical rocker arms; the camshaft was low on the right side. The valves were serviced through port plugs opposite which also carried the spark plugs. Later engines used a 3 3/4" bore and 6 3/4" stroke and sixteen valves. The carburetor was low on the right side, at the bottom of the Y-shaped intake passage cast in the block. The exhaust traveled a less tortuous distance, escaping by up-swept ports through the top of the cylinder casting. Connecting rods were heavy I-beam with four-bolt caps; pistons used three rings. Front end drive was by gears; magneto, oil and water pumps were on the right side of the block. A cone clutch and separate gearbox were used. Only two main bearings were employed, both ball type. This paucity of main bearings was a Duesenberg trait also found in later models—the 183 cu. in. racing engine and the early Model A passenger car each had but three main bearings for eight cylinders.

It isn't surprising that the four cylinder Duesenberg never won at Indianapolis. Foreign cars were scoring many victories on our tracks at that time; from 1913 to 1919 they won all Indianapolis races and approximately 40% of the first ten "money" positions. Duesenberg's best showing in the four cylinder days was Wilbur D'Alene's trouble-free ride to second place in 1916. A year earlier, when the 300 cu. in. class was introduced, Duesenbergs finished fifth and eighth. The performance of the car takes on added lustre if we remember that seldom were there many of them in any one race—on some occasions even the large Indianapolis starting field contained as few as two and three Duesenbergs. In 1923 only one started; completed the night before the race, with no practice or running-in it finished tenth after a last-minute qualifying run at dawn on race day.

A refined version of the racing engine, known as the Rochester-Duesenberg, was used after World War I by such sporty cars as Roamer, Revere, Meteor and Richelieu. Built by the Rochester Motors Corp. and labeled "The Power of the Hour," it used the outstanding features of the racing model—four cylinders, two main bearings, aluminum crankcase, etc. The cylinder casting, supplied by the Frontier Iron Works in Buffalo, had horizontal valves of 2 3/16" diameter and 14" rocker arms. (The first Duesenberg eight cylinder passenger car, shown late in 1920, had

*(Continued inside back cover)*

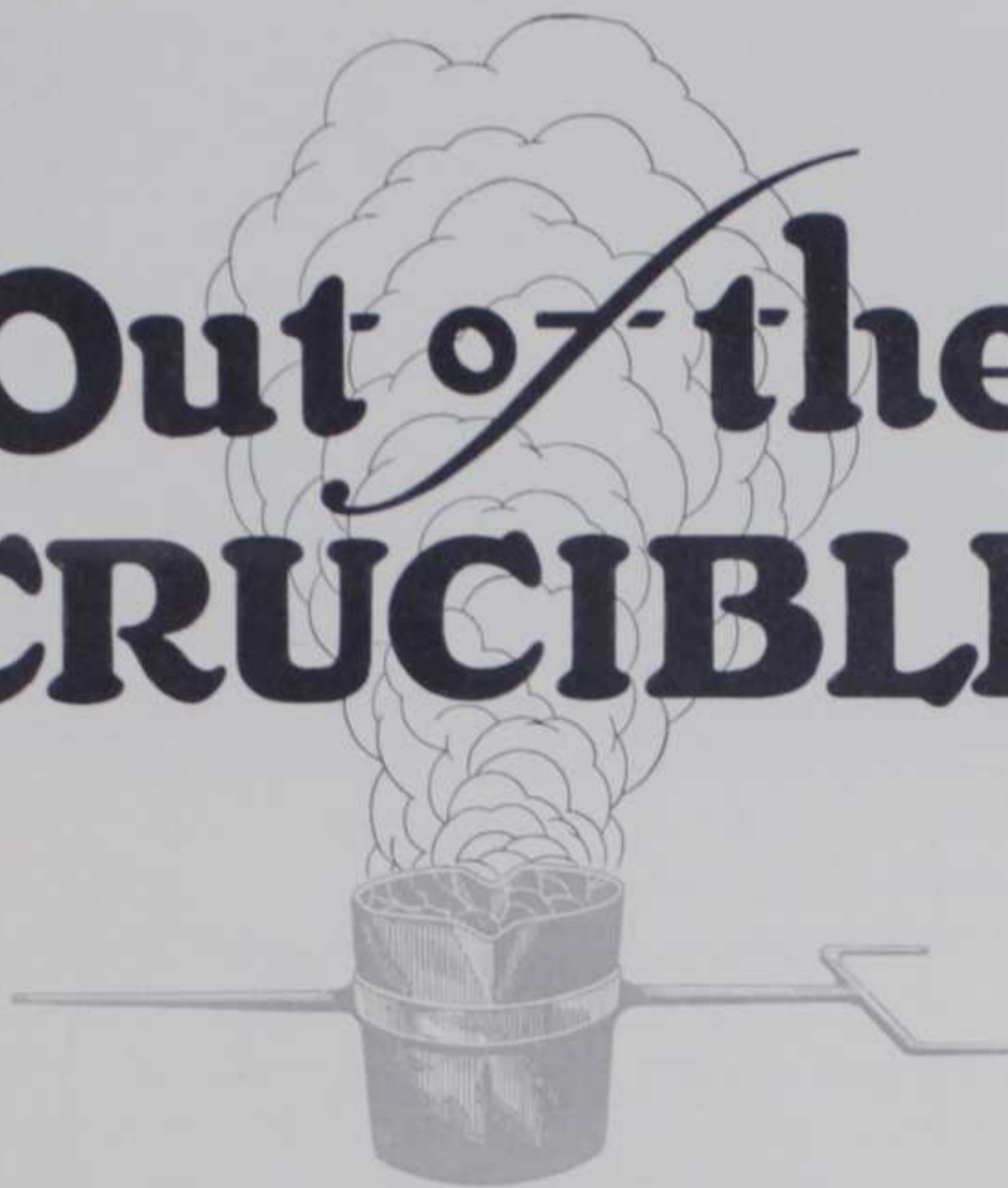


300 cu. in. racing engine—1915

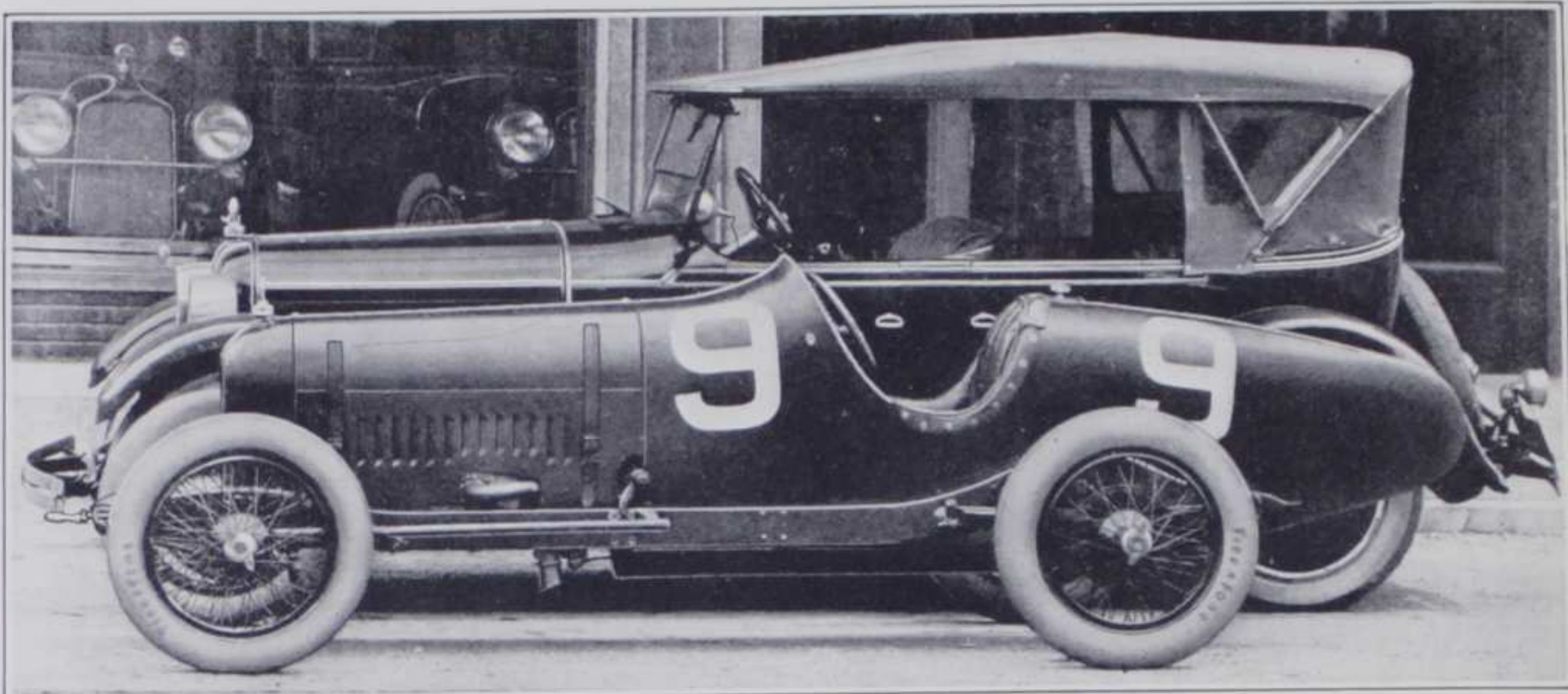




# Out of the CRUCIBLE







*A side by side comparison of the Duesenberg  
touring and racing cars, the champions  
of the road and track*



DUESENBERG AUTOMOBILE & MOTORS COMPANY, INC.  
INDIANAPOLIS, INDIANA





# FRUITION

¶ It has been aptly said that "Out of the crucible of motor car racing has come commercial perfection."

¶ There are few successful motor cars today which do not embody in some phase of their mechanical make-up direct or indirect characteristics of racing engineering.

¶ In the main, there are two classes of motor car manufacturers. First, there is the big volume producer. As nearly as possible his product imbibes racing engineering only in so far as is feasible without affecting the low price commensurate with volume manufacturing.

¶ There are many of these manufacturers; and no one can doubt the fact that they have an important place in modern transportation.

¶ On the other hand there is the maker who insists upon putting quality above quantity. He dedicates his efforts to that comparatively small class of motor car connoisseurs, whose love of mechanical perfection and beauty insists upon "pure strain" motor cars.

¶ To this latter class Fred Duesenberg makes his strongest and only appeal. Volume is not in his scheme of things. He is an engineer with a touch and devotion to his work like a Beethoven or a Rembrandt.

¶ It is not so important that Duesenberg racing cars hold more speed records than probably any other car. The important thing is that his commercial product



*Out of the Crucible of Racing has come Commercial Perfection*





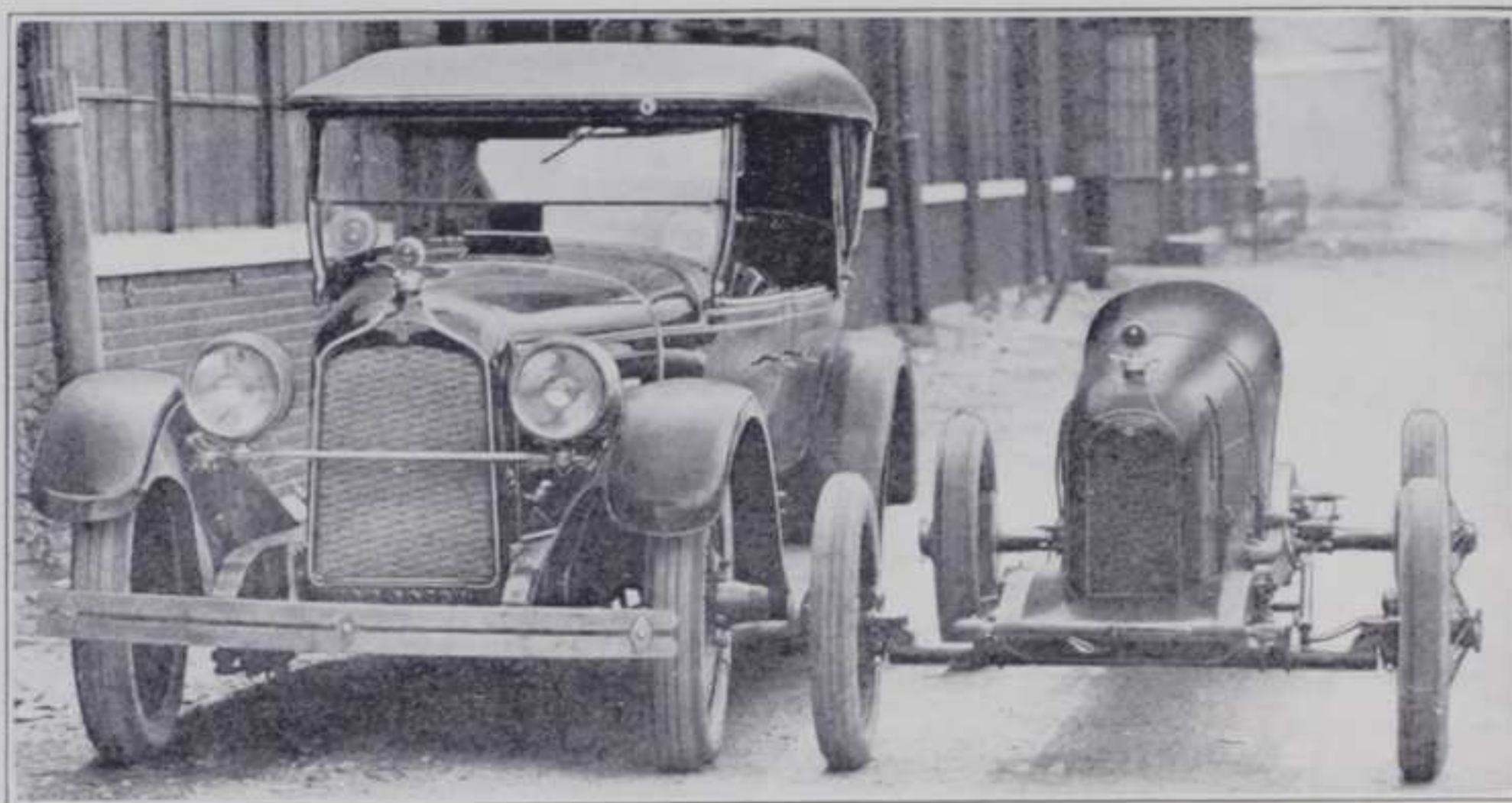


more closely parallels his successful racing engineering than any other car in the world.

☞ Naturally, Duesenberg motor cars are expensive. The manufacturer who most closely follows in his product the pure strain of the racing thoroughbred cannot produce inexpensive cars. Racing cars are costly. Who ever heard of a "bargain-counter" replica of a speed creation?

☞ But a Duesenberg is a thing of fineness and precision—a stress-enduring, masterful, mechanical creation—a veritable symphony in steel. And above all else, its ability has been proved with a double-barreled certainty—both on the track and in actual use.

☞ Nothing we might add will enhance the importance of the Duesenberg in the eyes of those who like fine things more than the following reprint from *Motor Age* by B. M. Ikert. This authority has impersonally disclosed the true and faithful nature of the Duesenberg that has reached perfection out of the crucible of racing.



*Equipped with top and fenders the Duesenberg 122-cu. in race car would look very much like a vest pocket edition of the stock car*



*Out of the Crucible of Racing has come Commercial Perfection*







Reprint from "Motor Age" July 10, 1924

# Comparing Race Car Design With Commercial Practice

*Smaller and More Efficient Engines. Racing Cars Not Always the Highly Specialized Creations as Generally Believed. Lighter and Stronger Parts Developed Through Racing*

By B. M. IKERT

**B**Y a constant process of eliminating certain constructions and substituting for them others, race cars have been made lighter, faster, easier riding and endowed with a greater factor of safety. This was forcibly illustrated in the last 500-mile Indianapolis race when it is recalled that the first five of the 122 cu. in. piston displacement cars finished at greater speeds than the old record of 94.48 m. p. h. The new record is 98.24 m. p. h. and the outstanding feature of the race aside from the smashing of all records is that the victorious cars had no mechanical troubles to speak of and came through the race in excellent shape.

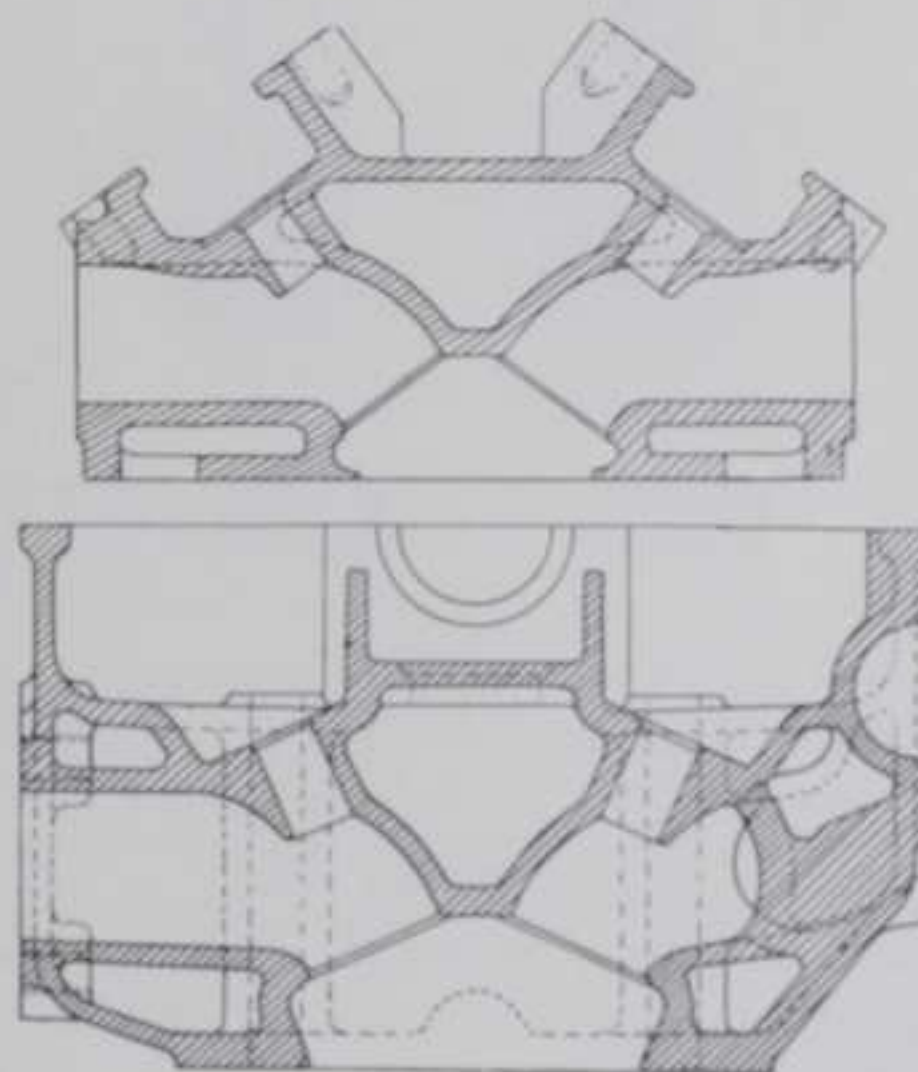
The results of the race showed that these small cars were not only the fastest but also the most reliable group of cars that ever raced over the Hoosier oval. Much of this reliability has been secured by proper weight distribution and strength in the chassis learned from past experience in racing.

## NOT BUILT IN A WEEK OR MONTH

No racing car of any consequence is built in a week or a month. Years of experimenting and many failures are responsible for the great performance of the cars which competed in this year's 500-mile race. Countless constructions have been tried in the past and abandoned and each year, although the piston displacement of the engines has become smaller, and speed of the cars have been greater.

It is unfortunate when a racing car smashes and yet the wrecks very often have furnished the best material from which new designs can be molded. By carefully going over a wrecked racing car the cause of the accident may be revealed, unless it was caused by some action of the driver and is obvious. But in the case of a very badly damaged car it is difficult to ascertain the exact cause some times. It may have been a flaw in the metal of some part or some part which may have been hurriedly put in was not heat treated sufficiently.

There were few mechanical failures in this year's cars which ran in the 500-mile race. Troubles seem to become less common as time goes on and designers and builders of racing cars develop new things and as the makers of steels and alloys develop new metals which are lighter and stronger. In the old days of racing and also in commercial building of motor vehicles if a part broke the common practice was to make it heavier. And even today in some of our stock cars parts are heavier very often than necessary because of the inability of the car makers to get metals which run uniform. Several car builders have made the statement that it would be possible to make their cars lighter in some respects, reducing the unsprung weight, etc., if it were possible to get the right material. In racing cars it has been possible to get the right material, because



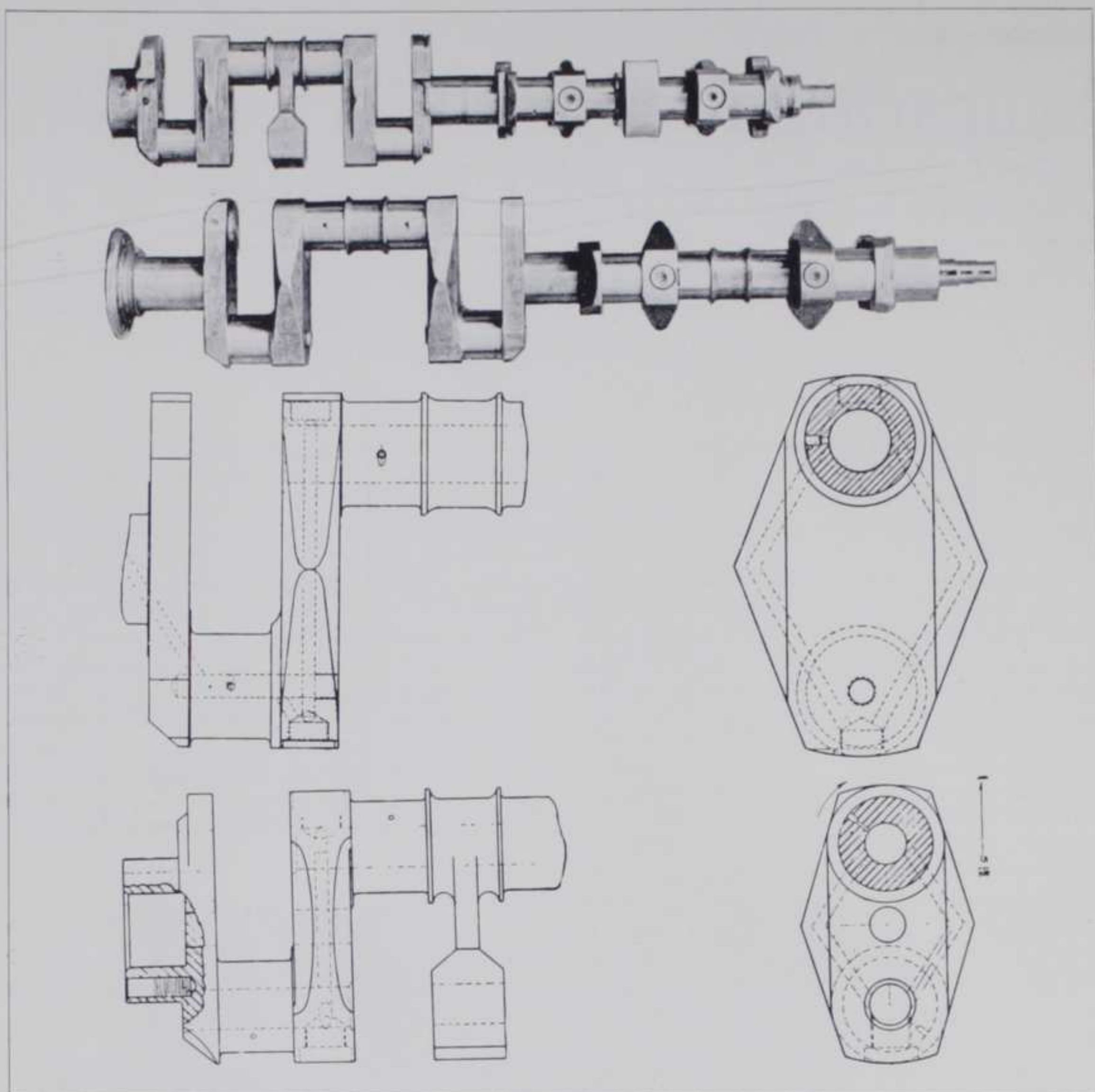
Sectional views of the Duesenberg racing engine head and that of the stock car, showing the similarity of the design. The racing engine has two camshafts, whereas the stock engine has one



*Out of the Crucible of Racing has come Commercial Perfection*







*Details of the crankshafts used in the Duesenberg racing and stock cars. The smaller shaft is that of the racing car*

of the unusual efforts put forth on the part of the builders and also because no expense is spared to go the limit in getting what is desired. This has made possible lighter parts for race cars and yet parts which are considerably stronger. There will, no doubt, be much of the same thing in our commercial practices in the next few years and, in fact, there is some of it now in evidence to some extent in stock cars.

#### A DIFFICULT THING TO FIGURE

Just how much of what has been accomplished on the race track is reflected in stock car design and construction is a rather difficult thing to figure, but an excellent opportunity is afforded this year to make a direct comparison

of the 122 cu. in. Duesenberg Special car, which won this year's race and the stock car of the same name and make which has a piston displacement of 260 cu. in.

After making a thorough and almost piece by piece analysis of the constructions and units incorporated in the present Duesenberg stock chassis and that of the racing car, it can be said without contradiction that the race car chassis is about 75 per cent stock.

The greatest outstanding difference in the two is that the race car is smaller, this being necessary on account of the 122 cu. in. piston displacement restriction, and the 1,450-pound weight limit which means that the weight of all parts must be kept to a minimum.



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When we make the statement that about 75 per cent of the race car is stock we do not mean that the majority of parts are interchangeable with the stock car, but we do mean that stock forgings are used in a great many instances these being simply machined smaller to meet the weight restrictions of the 122 cu. in. race car. It must be understood for one thing that the stock car has a 134 in. wheelbase while that of the race car is but 100 in. This naturally means a shortening up of the drive shaft and other units, but basically the method of drive and the layout of the units in both chassis are the same. Reference to the photographs and blueprint reproductions will bear out the latter statement.

Naturally in the race car several things had to be done to get the utmost in speed and stamina. These are the two qualities sought by the race car builder and in their attainment things are often done which would not be necessary in a stock car. The use of a super charger, for instance, added considerable to the performance of the small 122 cu. in. engine used in some of the Duesenberg race cars this year. When these small engines reach 4,000 r.p.m. the supercharger becomes very effective, this being shown by the fact that they have reached a speed of 5,200 r.p.m. without loss of power. Thus, as it becomes necessary to speed up the small engines the use of the supercharger is quite effective, but for commercial purposes and with stock engines of over twice 122 cu. in. piston displacement, the supercharger is not as yet deemed very essential by most designers and builders of engines and cars.

#### SPEED AND STAMINA

Speed and stamina are two of the things which the Duesenberg Automobile and Motors Co. has sought to build into its stock car. The Duesenberg car appeals strongest, perhaps, to a class of buyers who seek high sustained road speeds. And as such the car must necessarily have the qualities to "stay put" over all kinds of road conditions just as the race car must be able to stand up under the terrific strain of racing.

It is but natural therefore, that a concern building both race and stock cars should incorporate certain design and constructional features in each type of car, which it has found from experience give the desired results.

To give some idea of the dove-tailing of the efforts on each type of car the experience which Fred and August Duesenberg have had with rear axles is cited.

Back in 1913 one of the drivers of the Duesenberg race cars broke five rear axles during the season. During the winter months following the Duesenberg brothers and their assistants started in to revamp the axles which had been bought on the open market from the axle makers "as is." The axles had been changed by the Duesenbergs in several respects to adapt them for racing, but they still were far from satisfactory. The process of revamping has been going on steadily until an axle has been obtained which is lighter in weight and which meets all the requirements of racing. One has only to recall that axle troubles, in fact, trouble of any kind rarely develops in



At the left is the piston and connecting rod assembly of the Duesenberg racing car, while the other is that of the stock car. Both rods are tubular and carry cooling flanges



Jimmy Murphy

It was a Duesenberg Straight Eight that Jimmy Murphy drove to victory in the French Grand Prix and established a new road record at Le Mans, France, in June of 1921, outdistancing the field by fourteen minutes and fifty-nine seconds. His was the only American car that ever won or was placed in an important foreign event.

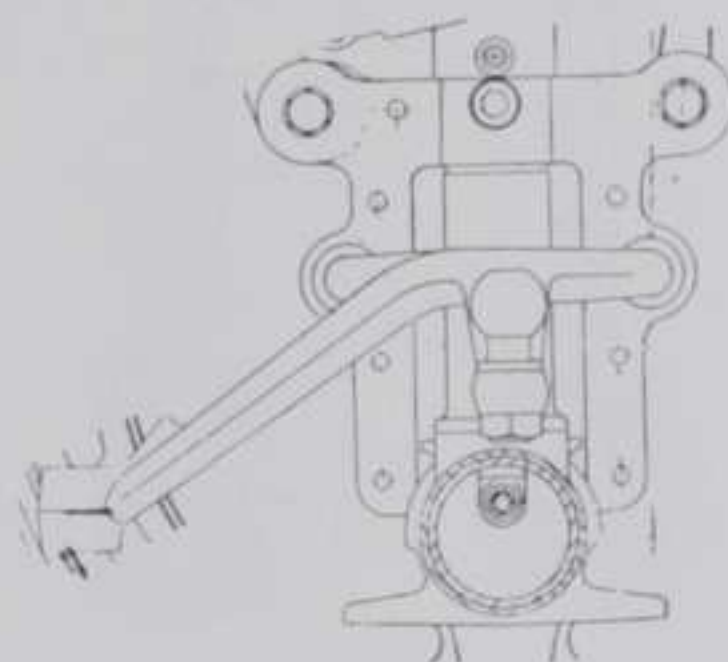
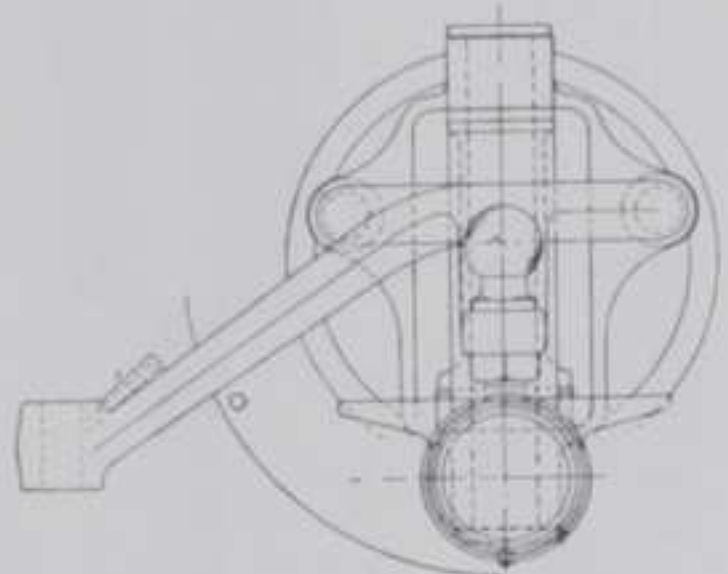
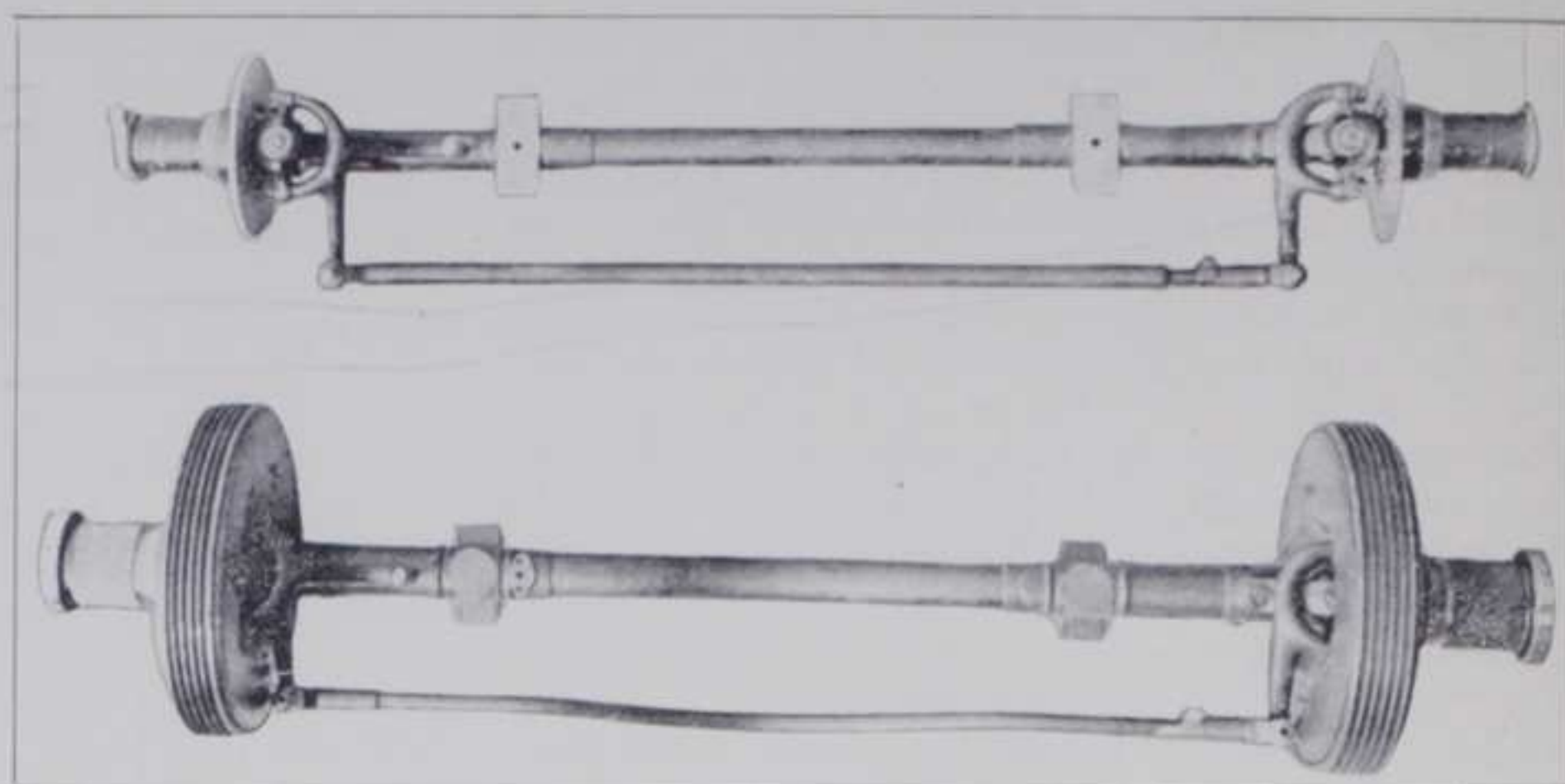


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As shown here the front axle layout of the Duesenberg racing and stock cars are very much the same. In fact, the steering arms and several of the other forgings are exactly the same. The essential difference is that the brakes are eliminated from the front axle of the racing car



stock car has as yet encountered any difficulties in the way of rear axle breakage.

In making the comparison of the Duesenberg race car and stock car, we find some difference in the engine design, this difference being largely justified in the endeavor to get down the weight. For example, the race engine has an aluminum block in which are fitted eight steel sleeves serving as cylinder bores, whereas the stock engine block is cast iron and without sleeves.

The race car engine has two overhead camshafts, these being driven by a chain of gears at the front end. In the stock engine, which incidentally has a piston displacement of 260 cu. in. there is a single overhead camshaft, the latter being driven by a vertical shaft and bevel gears. It is quite evident that two camshafts overhead can be driven with less complications by spur gears than would be the case if a vertical shaft were employed.

#### SAME SYSTEM FOR BOTH

In the matter of lubricating the engines the most interesting thing is that the same system is used for both. The only difference is that in the case of the stock engine the oil enters the crankshaft at three points, whereas it enters at one point in the race engine. Thus relatively speaking, it might be said that the stock car engine, in a sense, is even better oiled than the race car engine. The oil pumps are identical. About the only difference in the oiling system outside of the method of taking in the oil in the crankshafts is that in the stock engine there is a cored passage for the oil in the front end of the cylinder block which carries the lubricant to the overhead camshaft, while in the race engine an exterior tube does the same thing. Both engines are oiled substantially as follows:

The oil after being forced through the crankshaft enters the connecting rod bearings. Another line leads from the pump up to the hollow camshaft entering the latter at the forward bearing. All of the camshaft bearings are oiled through holes drilled in the camshaft. In the stock engine the oil is forced from the same source in the front bearing

the various units of the chassis with the exception of the engine wherein the parts are so much more highly stressed.

The Duesenberg brothers attribute this lack of trouble largely to the design and light weight of the parts. Incidentally getting the weight of a unit like the rear axle down materially reduces the tendency for slippage at high speeds, to say nothing of the easier riding and handling of the car by virtue of less unsprung weight.

How this is reflected in the stock Duesenberg car is shown by the fact that the rear axle weighs about one-quarter less than axles of cars in the same weight class. In addition Mr. Duesenberg states that owing to the construction of the axle, which has been developed side by side with the racing car axle, it is 30 per cent stronger than stock axles called upon to meet the same conditions. It is interesting at this point to know that no Duesenberg



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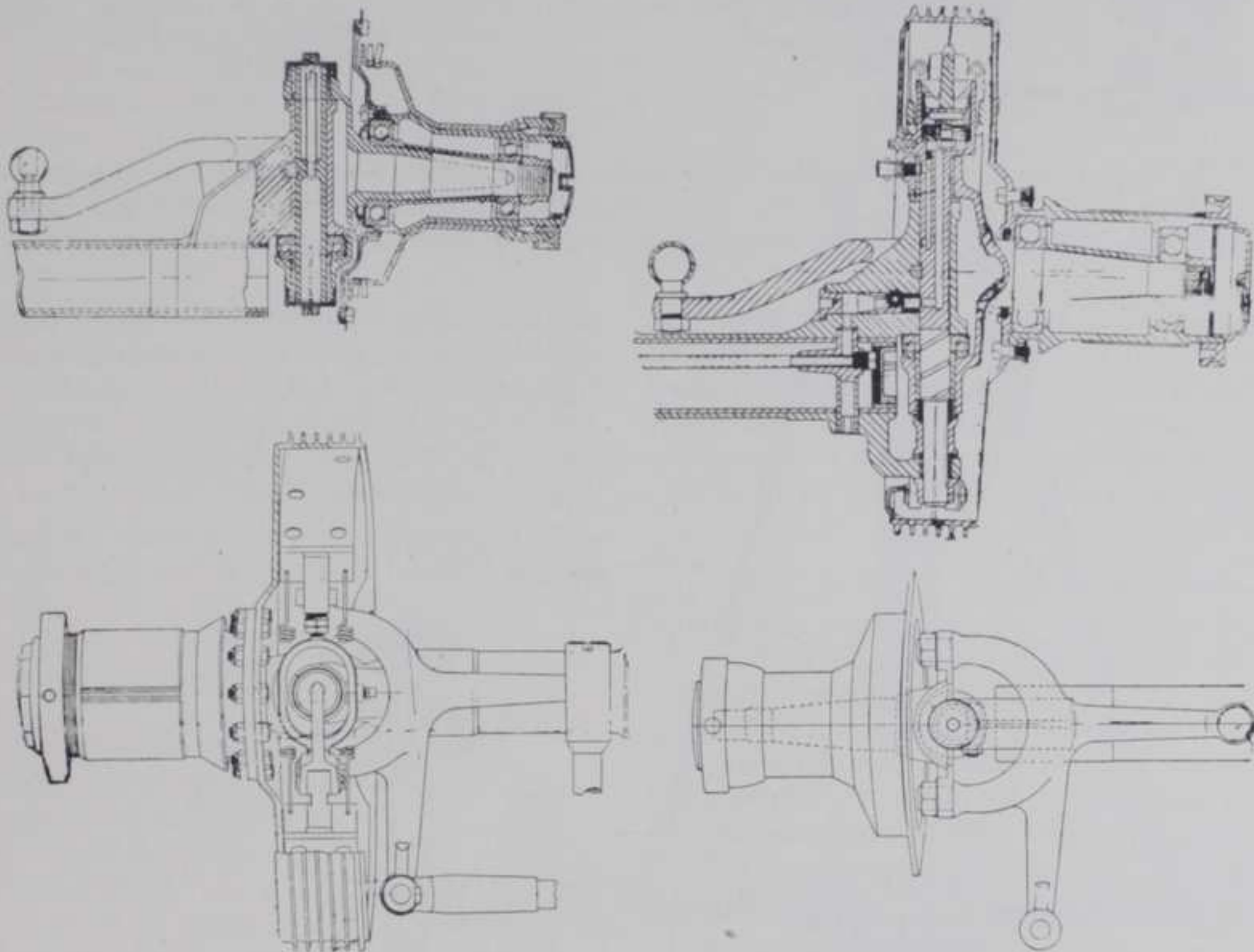
of the camshaft through the hollow rocker shaft, which also is drilled in order to lubricate the rocker arm bearings. The oil passes through these bearings onto the cylinder head, drains into a trough lubricating the cams and rocker arm rollers in a bath of oil. From there it drains into the head and back into the crankcase, at the forward end passing over the bevel gears on the vertical driveshaft, while at the rear it passes through a tube.

The race car engine is lubricated in practically the same way excepting that modifications have to be used for oiling the ball bearings supporting the crankshaft at the front and rear end. The overhead camshaft gears and drive gears are oiled in precisely the same manner as the vertical shaft gears of the stock engine.

The oil pump of the stock engine revolves at engine speed, while that of the race engine revolves at one-half engine speed. However, since the race car engine turns over much faster than the stock engine the speeds of the pumps are about the same.

Excepting for size both crankshafts are laid out the same way. The cheeks of the throws are the same as will be noted from the illustrations. Both shafts are carried on three bearings, these being plain babbitt lined bronze backed bearings in the stock engine while ball bearings are used in the race car engine for the front and rear only, the center being a plain bearing.

Some difference occurs in the crankshafts as to the method of attaching the flywheel, this being necessary



Above are sectional views of the front axle king pin layout on the racing and stock Duesenberg axle. The other two views show the duplication of steering arms



Joe Boyer

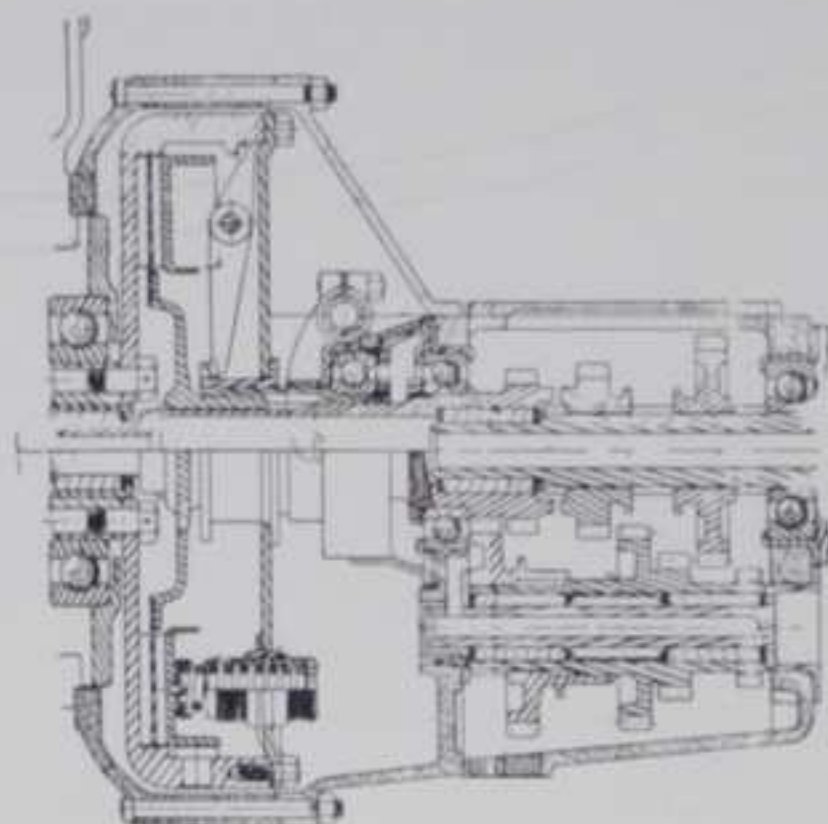
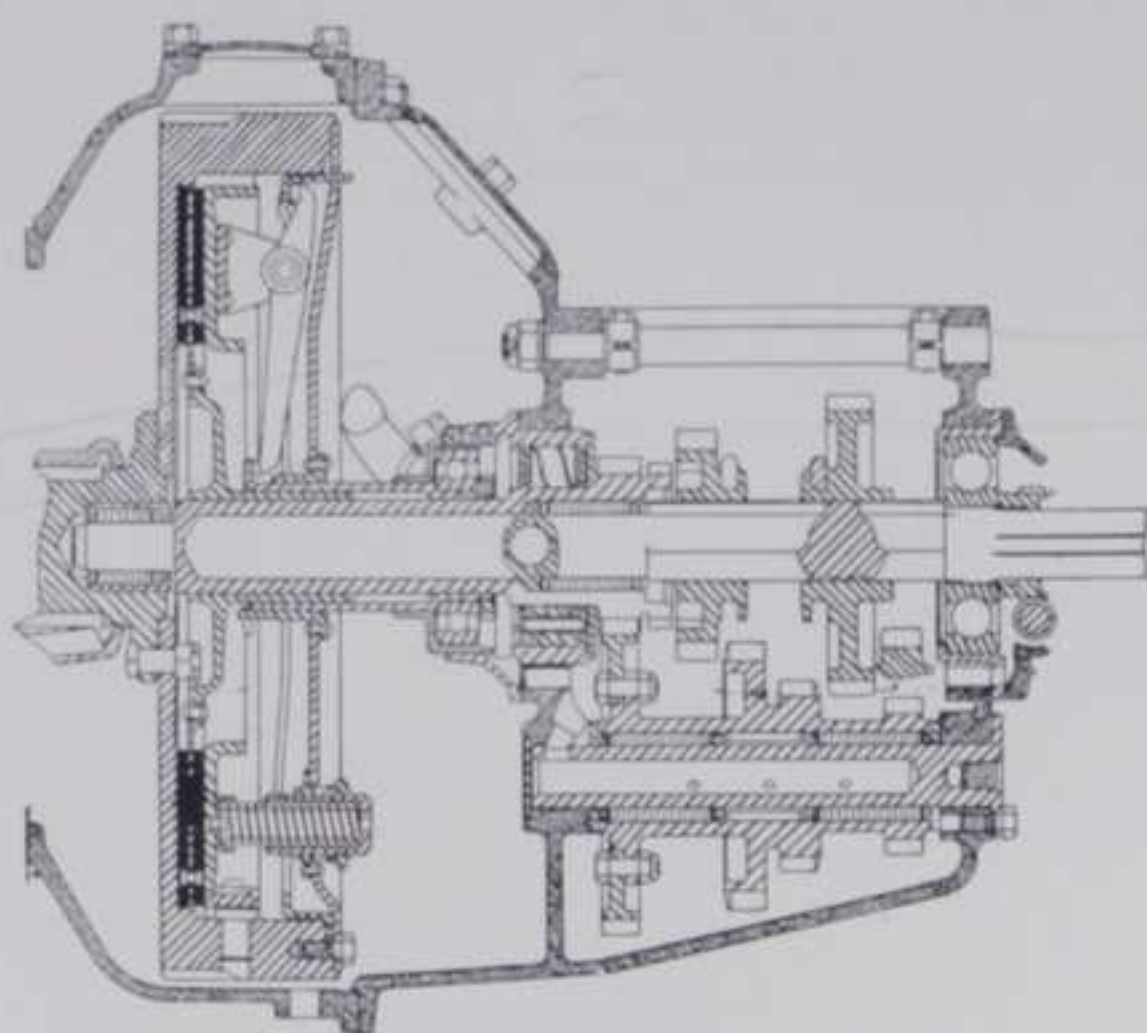
It was a Duesenberg in the hands of Joe Boyer that won the 1924 International 500-mile race at the Indianapolis Motor Speedway May 30th, establishing a new world's record for the distance in the most thrilling drive ever seen in an automobile race.



*Out of the Crucible of Racing has come Commercial Perfection*







The transmission and clutch layout are practically the same. The clutch and transmission of the stock car is shown at the left. Aside from being smaller the racing car transmission differs from the other in that the countershaft gear is thrown out of mesh when in high gear

owing to the use of a ball bearing for the rear bearing in the race engine. There is, therefore, no flange on the end of the crankshaft, of this engine and the cap screws holding the flywheel are inserted directly into the end of the shaft which forms the seat for the inner race of the ball bearing. The stock engine uses a flange on the shaft as in conventional practice.

#### COOLING BY PUMP SYSTEM

Cooling in both cases is by a pump system, the pumps being exactly the same for each engine. The cores in the radiators are identical excepting that the one in the race car is smaller. What has been said in a preceding paragraph regarding the speeds of the oil pumps on the two engines applies equally well to the water pumps, the latter being driven at the same speeds in each case as with the oil pumps.

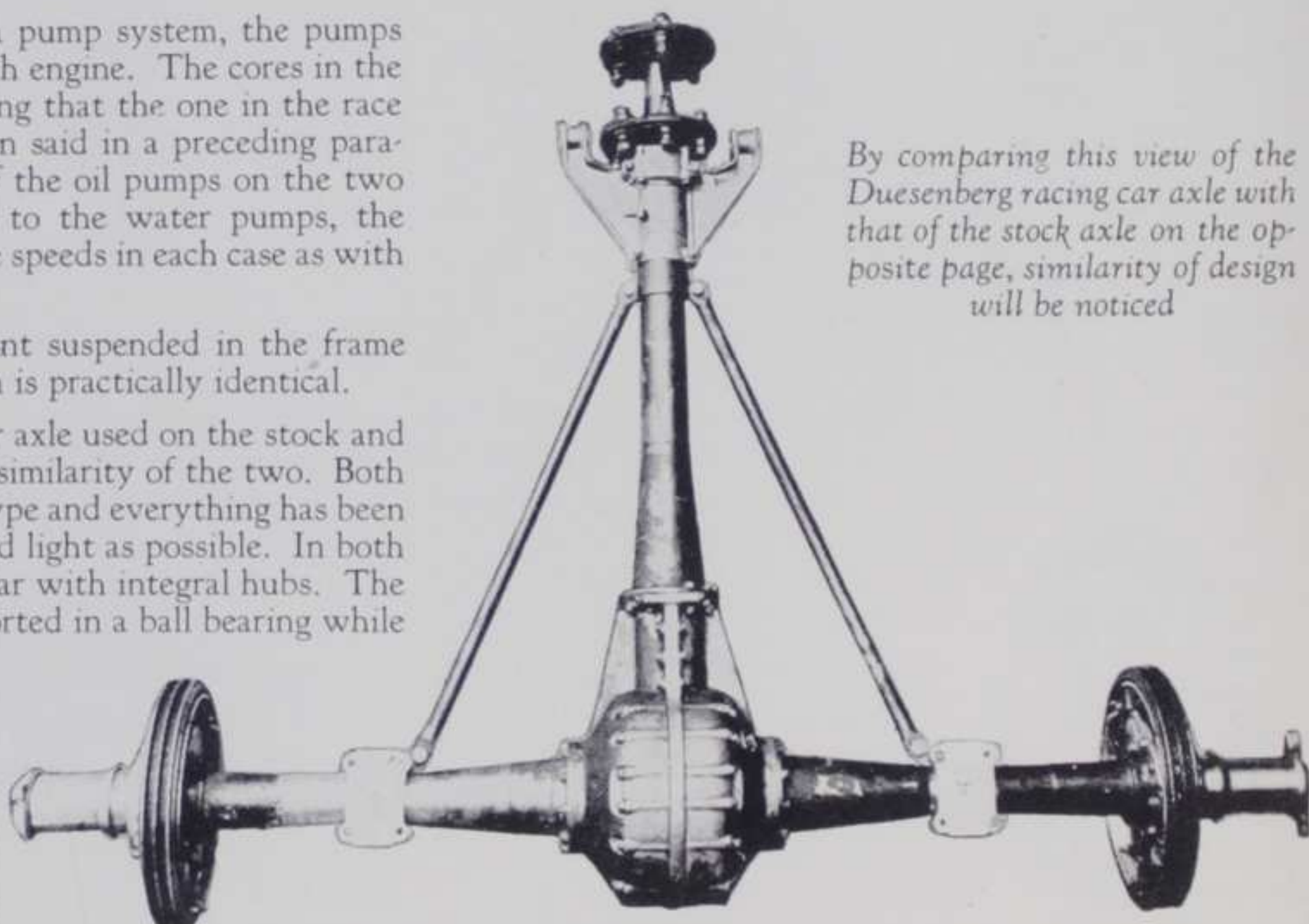
Both engines are three point suspended in the frame and the method of installation is practically identical.

The illustrations of the rear axle used on the stock and that of the race car show the similarity of the two. Both axles are of the semi-floating type and everything has been done to get them as strong and light as possible. In both cases the axle shafts are tubular with integral hubs. The hub end of the shafts is supported in a ball bearing while the inner end is attached to the side gear in the differential by splines.

The differential layout is practically the same in both axles and the manner of mounting on ball bearings is

identical. The ring gear carrier of the racing axle, while smaller, is made from a stock part and the ring gear is bolted to the carrier while in the stock car it is riveted. The stock axle also is provided with an adjustment for getting the proper mesh of the ring gear and pinion, while there is no adjustment in the race car axle.

Both the pinion shaft of the race car and stock car are mounted on ball bearings in the same manner, with the



By comparing this view of the Duesenberg racing car axle with that of the stock axle on the opposite page, similarity of design will be noticed



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exception that a double row type of bearing is used in the stock car. Both pinion shafts are hollow to save weight and in the race car the shaft is made with splines on the inside, whereas the splines are on the outside in the stock car pinion shaft. A spacer of the same type is used between the two bearings of both pinion shafts in both cars.

### BOTH AXLES EMPLOY RADIUS RODS

Both rear axles employ radius rods and driving and braking reaction is through a torque tube which is flange mounted to the rear axle housing in the same manner in both cars. The yoke at the forward end of the torque tube is practically the same in each case differing chiefly in the material used, that of the race car being an aluminum alloy while steel is used in the stock car. Reference to the illustrations of the two axles shows also that the universal joint layout is identical, there being two in each case. About the only difference here is that in the race car the propeller shaft brake is placed behind the transmission while on the stock car it is incorporated within the yoke of the torque tube. The housings for the rear axles differ chiefly in that the one of the race car is built-up housing, while a banjo type is used for the stock rear axle.

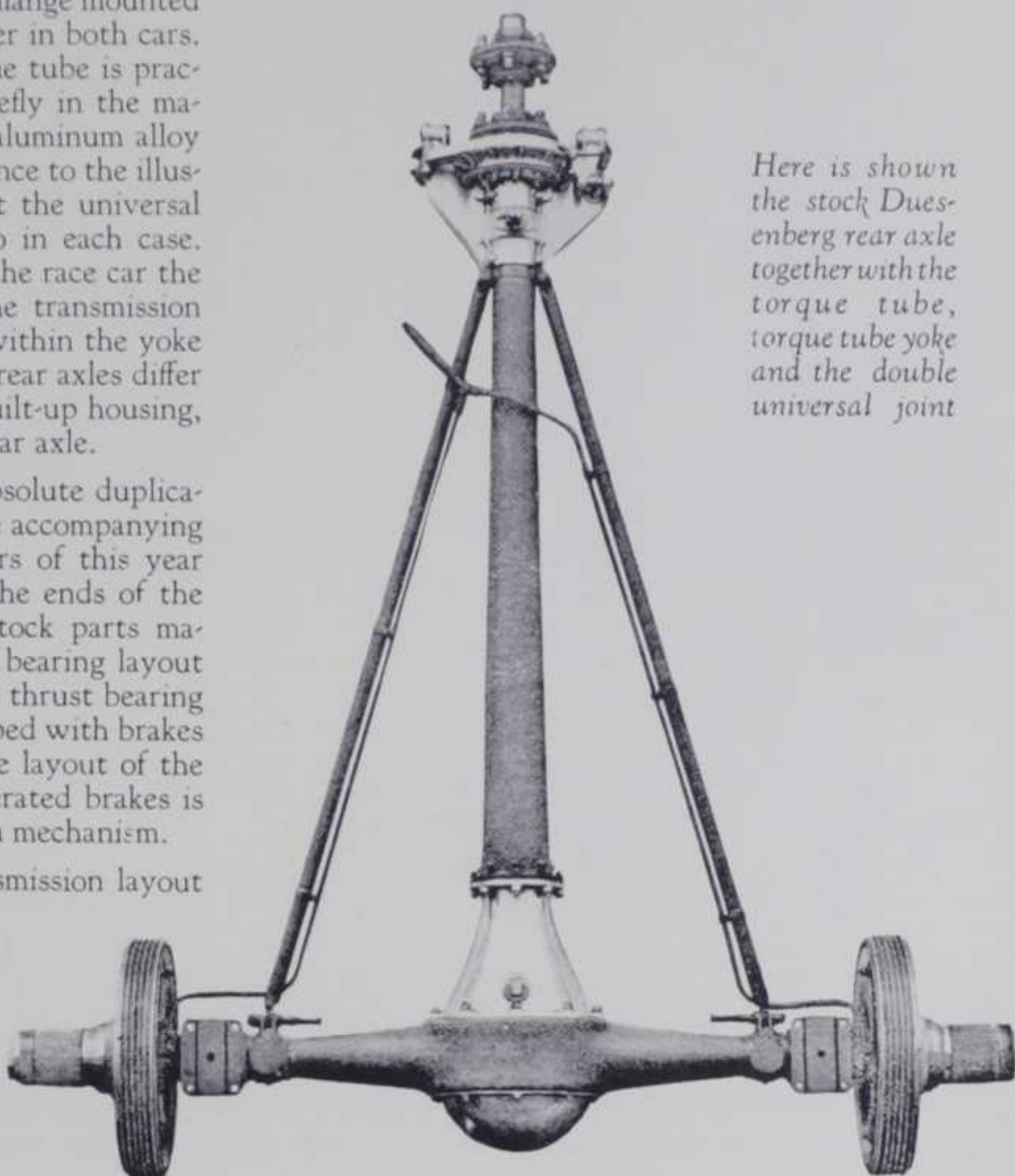
Coming to the front axle we find an absolute duplication in the steering arms, as shown by the accompanying illustrations. The Duesenberg racing cars of this year used stock forgings for these parts and the ends of the axle tube supporting the knuckles are stock parts machined down a little smaller. The wheel bearing layout is the same in both front axles even to the thrust bearing of the king pins. The race car is not equipped with brakes on the front wheels and consequently the layout of the stock axle which carries hydraulically-operated brakes is somewhat different to provide for the extra mechanism.

Excepting for size the clutch and transmission layout of the racing car and stock car are the same. As in many of the other units, we find that some of the clutch parts are made from stock parts machined smaller. An example of this is the clutch driving hub. Both clutches are of the dry plate type and reference to the sectional views shows

the similarity of the disengaging levers, clutch pilot bearing, release bearing, etc.

### TRANSMISSIONS DESIGNED ON SAME LINES

The transmissions are designed along the same lines and outside of the difference in size about the only way they differ is that in the racing car the large countershaft gear or what is commonly called the constant mesh gear is thrown out of engagement when the shifting lever is high



Here is shown the stock Duesenberg rear axle together with the torque tube, torque tube yoke and the double universal joint



Tommy Milton

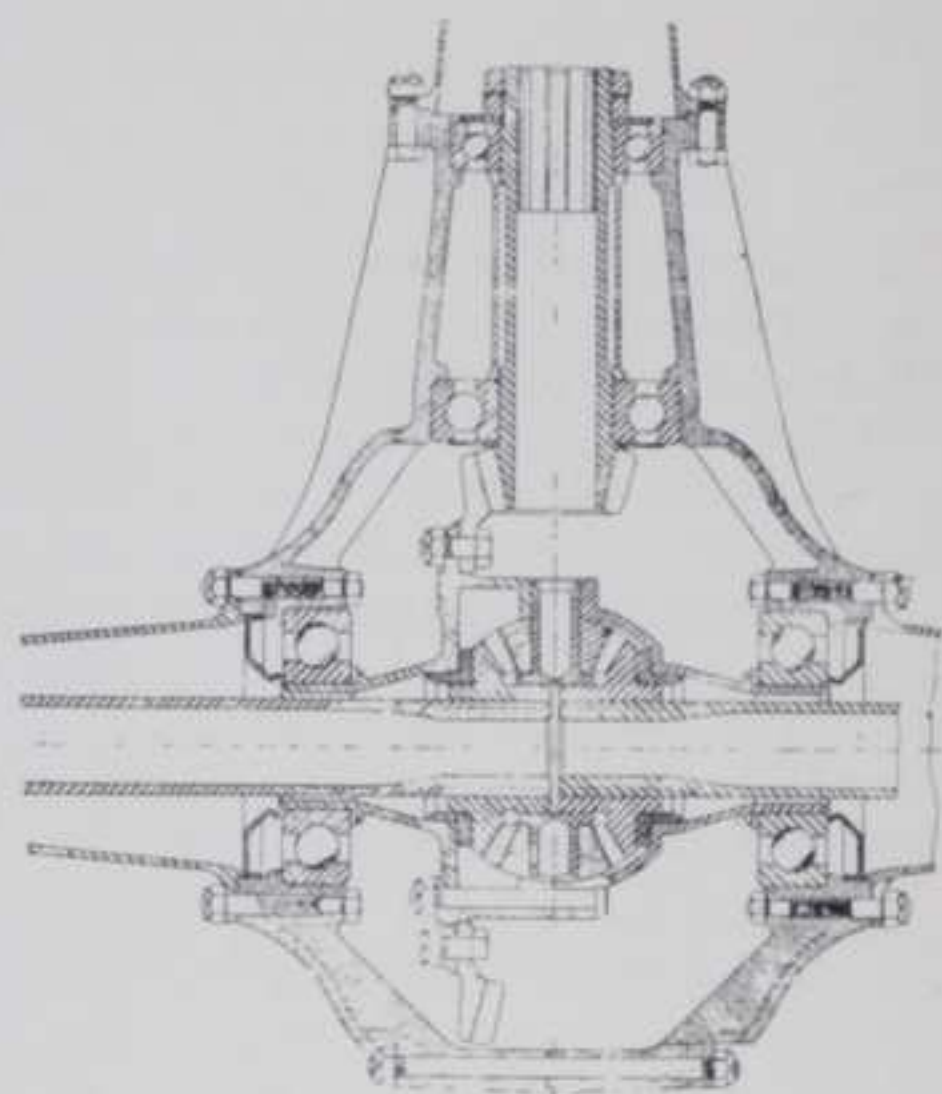
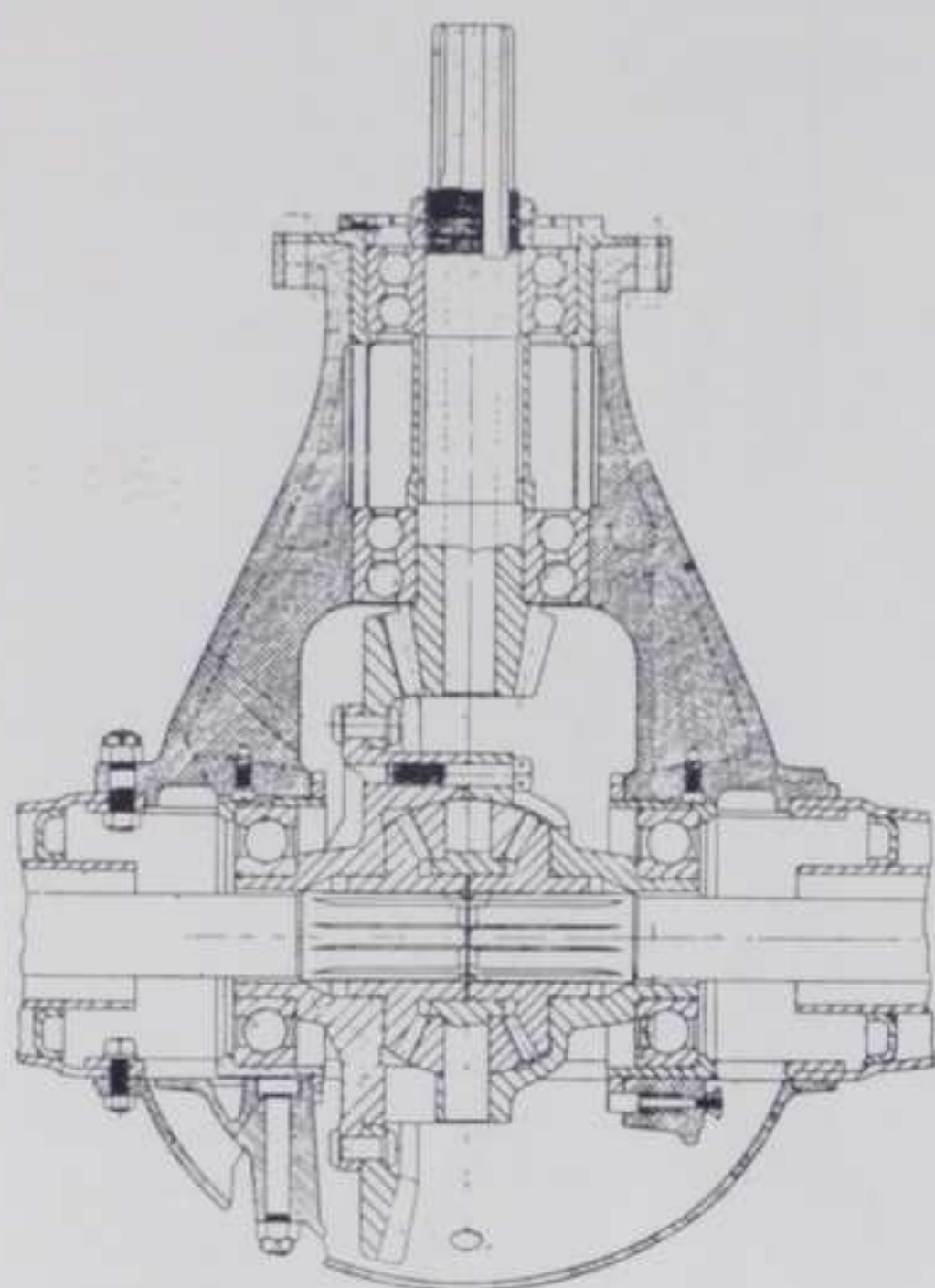
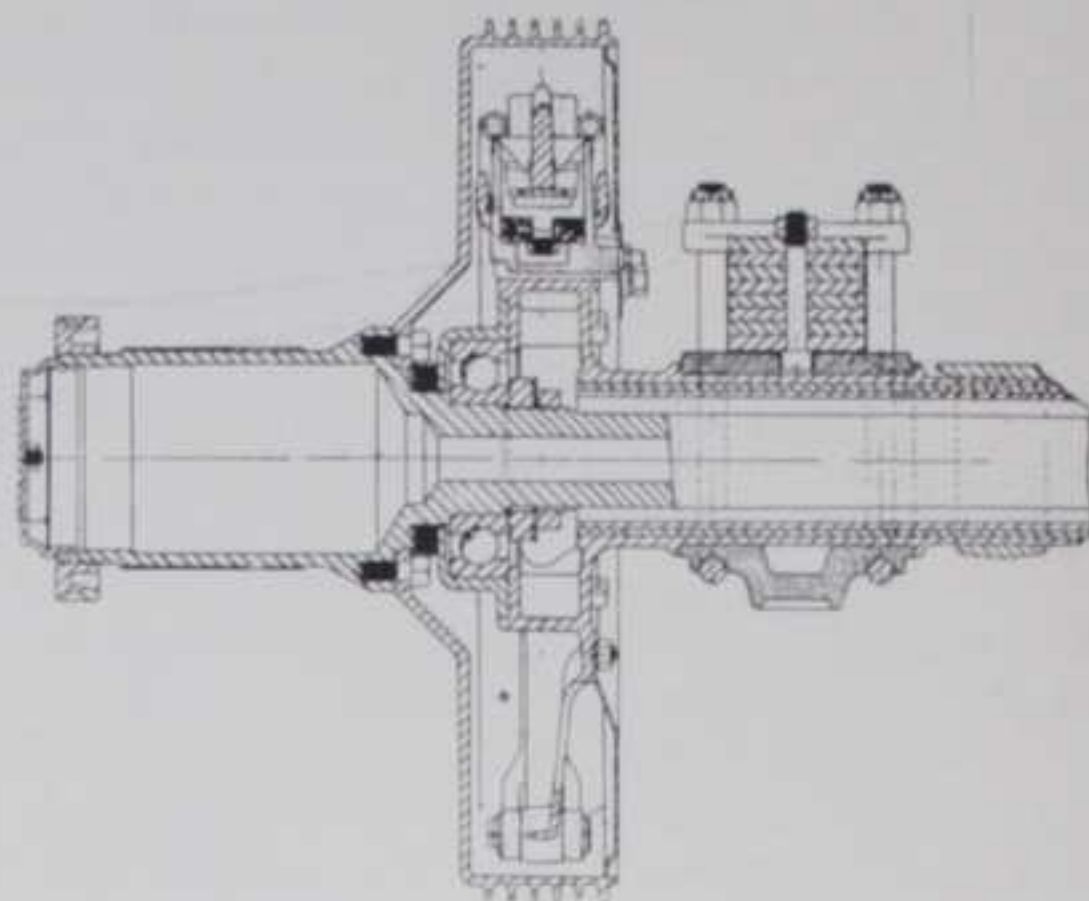
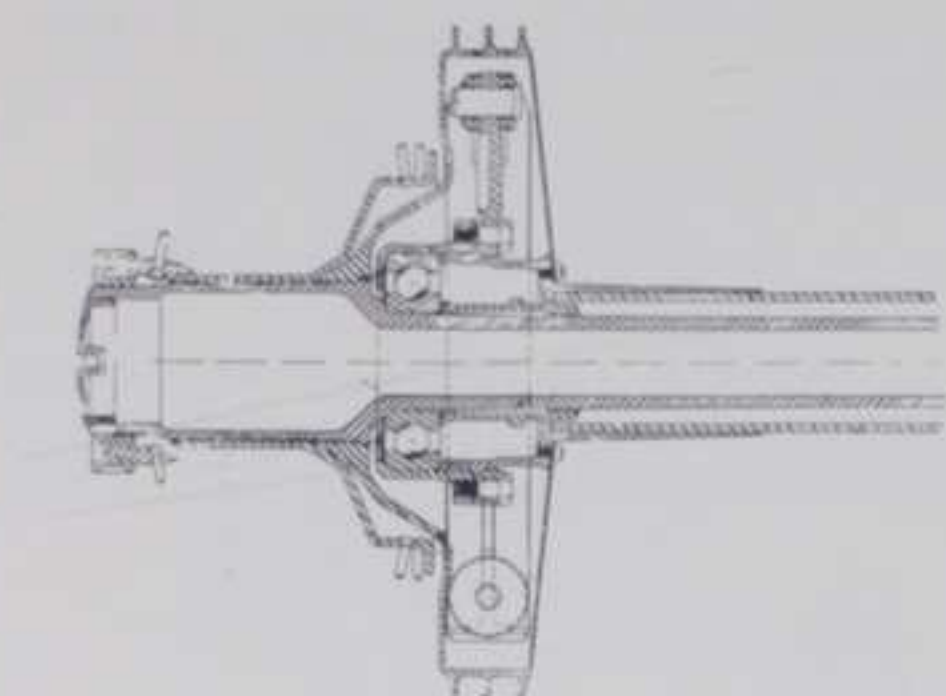
*It was a Duesenberg, with Tommy Milton at the wheel, that flashed across the sands of Daytona Beach, Florida, at a speed of 156.46 miles an hour, the fastest an object has ever travelled on four wheels.*



*Out of the Crucible of Racing has come Commercial Perfection*







Sectional views of the differentials and axle ends of the Duesenberg stock and racing cars. This shows the similarity of design, particularly in the tubular axle construction. In both instances the differential casing is made of drop forgings instead of castings. The racing axle is, of course, smaller than the stock axle and many of the parts used in the former are stock parts machined smaller.

gear. Thus the countershaft of the racing car transmission is stationary when the car is in high gear. This is shown in the sectional drawing.

Hydraulically operated brakes using the same general layout are used on both stock and racing models. As in the stock car the race car uses a master cylinder, the piston of which forces the liquid into the lines leading to the

brakes on the wheels. The position of the master cylinder of the racing car is a little different from that of the stock car, but fundamentally the systems are laid out and operated exactly the same way, the only exception being that the front wheels of the race car are not fitted with brakes.

Excepting for a few modifications for racing, the steering gear of the racing car is the same as in the stock model.



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Both gears are of the cam and lever type and made by the same maker. There are no spark and throttle tubes in the column of the racing car steering gear and to eliminate shocks the column is fitted with an insulating device of clever design. This device replaces the fabric disk formerly used on the Duesenberg racing cars to absorb vibration. The drag link of the racing car also is longer than that of the stock model.

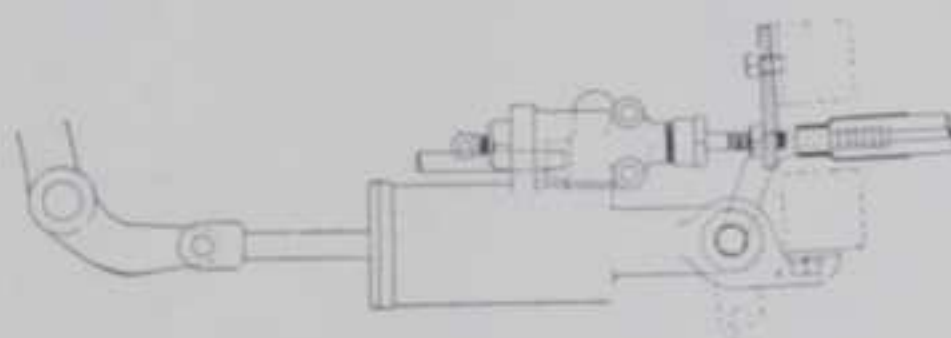
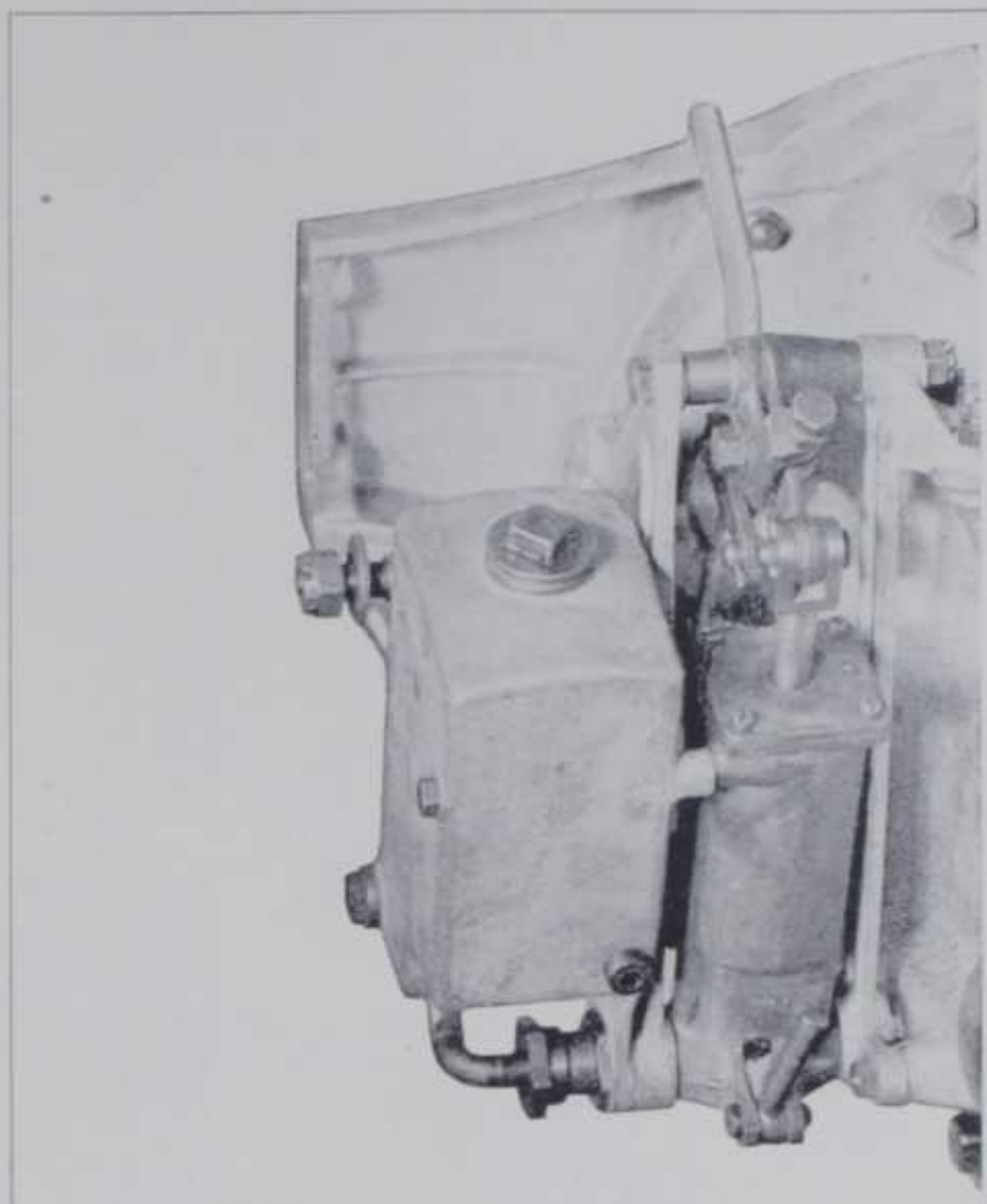
### SEMI-ELLIPTIC SPRINGS

Both the racing car and the stock car are fitted with semi-elliptic springs, the springs of the racing car, of course, being smaller. They also are attached to the side of the frame whereas in the stock car they are attached directly under the frame side rails.

Some of the Duesenberg racing cars are fitted with the conventional form of spring shackles while others have rubber shock insulators, a practice which has worked out so well on the racing car, that they no doubt will be incorporated in the stock car in the future.

The frames have little in common, due chiefly to the entirely different requirements. To get the racing car low the front of the frame is kicked up over the axle and to get light weight the frame is made of Duralumin.

Even in general looks the racing car and stock car have something in common. One has but to get them alongside each other to appreciate this. The radiator and hood lines are very much the same and if one placed a racing type body on the stock model the racing car alongside it would look very much like a vest pocket edition of the former.



Hydraulically operated brakes are used on both the racing and stock Duesenberg cars, the only difference being in the position of the Master cylinder, the latter being placed horizontally instead of vertically in the race car.



Eddie Rickenbacker

*It was a Duesenberg, piloted by Eddie Rickenbacker, that outdistanced all American and foreign cars in a 300-mile race at Sioux City, Iowa, July 4, 1914—winning the first important international event for the Duesenberg car.*



*Out of the Crucible of Racing has come Commercial Perfection*







**RALPH DePALMA**



**RALPH MULFORD**



**HOWARD WILCOX**



**EDDIE HEARNE**



**EDDIE O'DONNEL**



**L-L CORUM**



**PETER De PAOLO**

MORE than seventy-five percent of the advancement in the steady progress of the automotive industry is directly traceable to the race course, the laboratory of the industry.

Six years ago the Duesenberg Brothers built the first straight eight racing car. Within a year they had annexed more than sixty world's records with their creation and have attained more victories in competition than any other car ever built.

In the course of the interesting Duesenberg racing history, every driver of importance has been at the wheel of a Duesenberg. Many of the stars of today started their speedway career in a Duesenberg car.

EARL COOPER  
PHIL SHAFER  
HARRY HARTZ  
ERNIE ANSTERBERG  
JERRY WONDERLICH  
BENNIE HILL

DAVE LEWIS  
ROSCOE SARLES  
WILLIAM HAUPT  
ALBERT GUYOT  
GEO. MASON  
PETE HENDERSON

AND MANY OTHERS



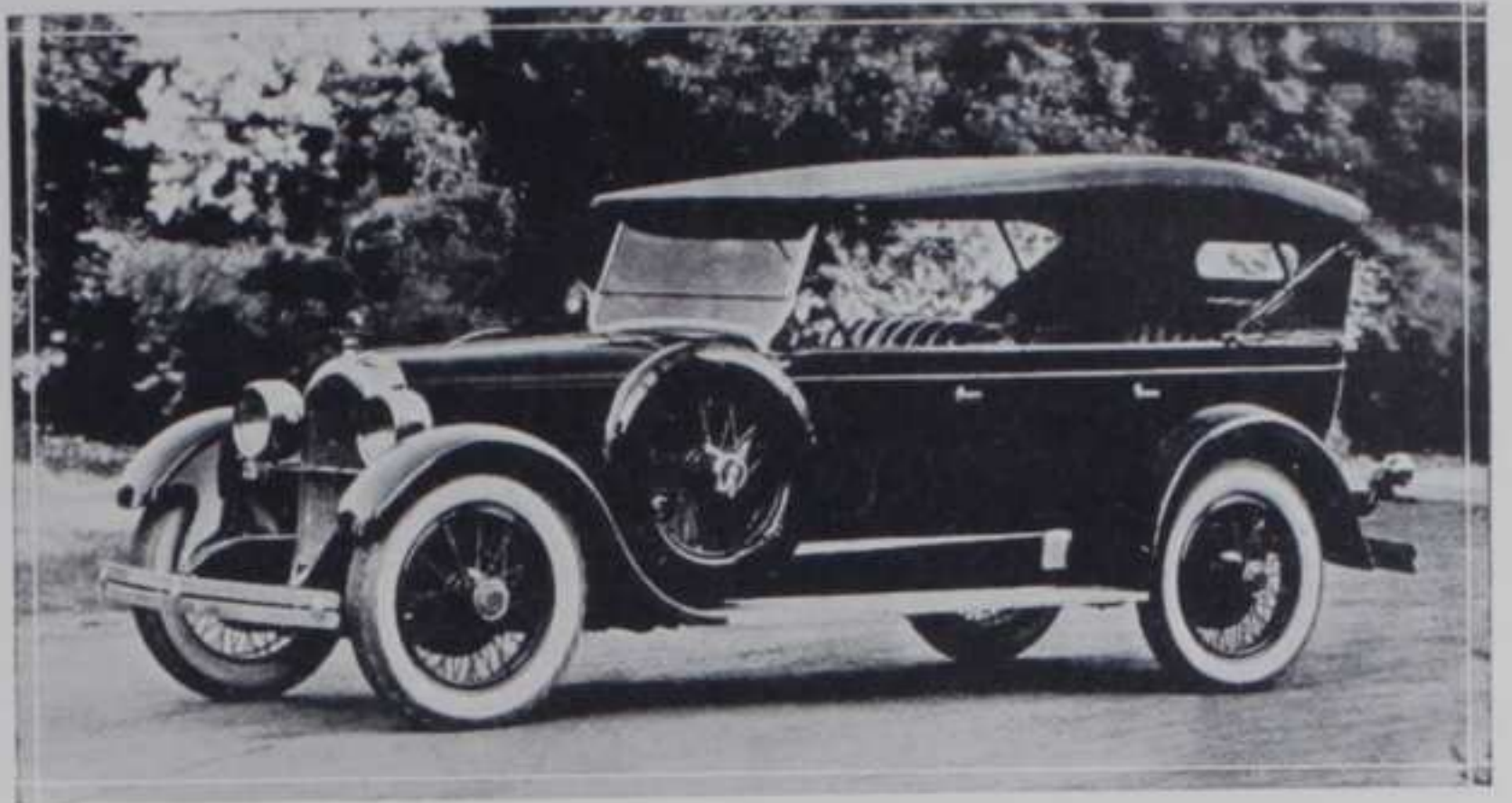
*Out of the Crucible of Racing has come Commercial Perfection*



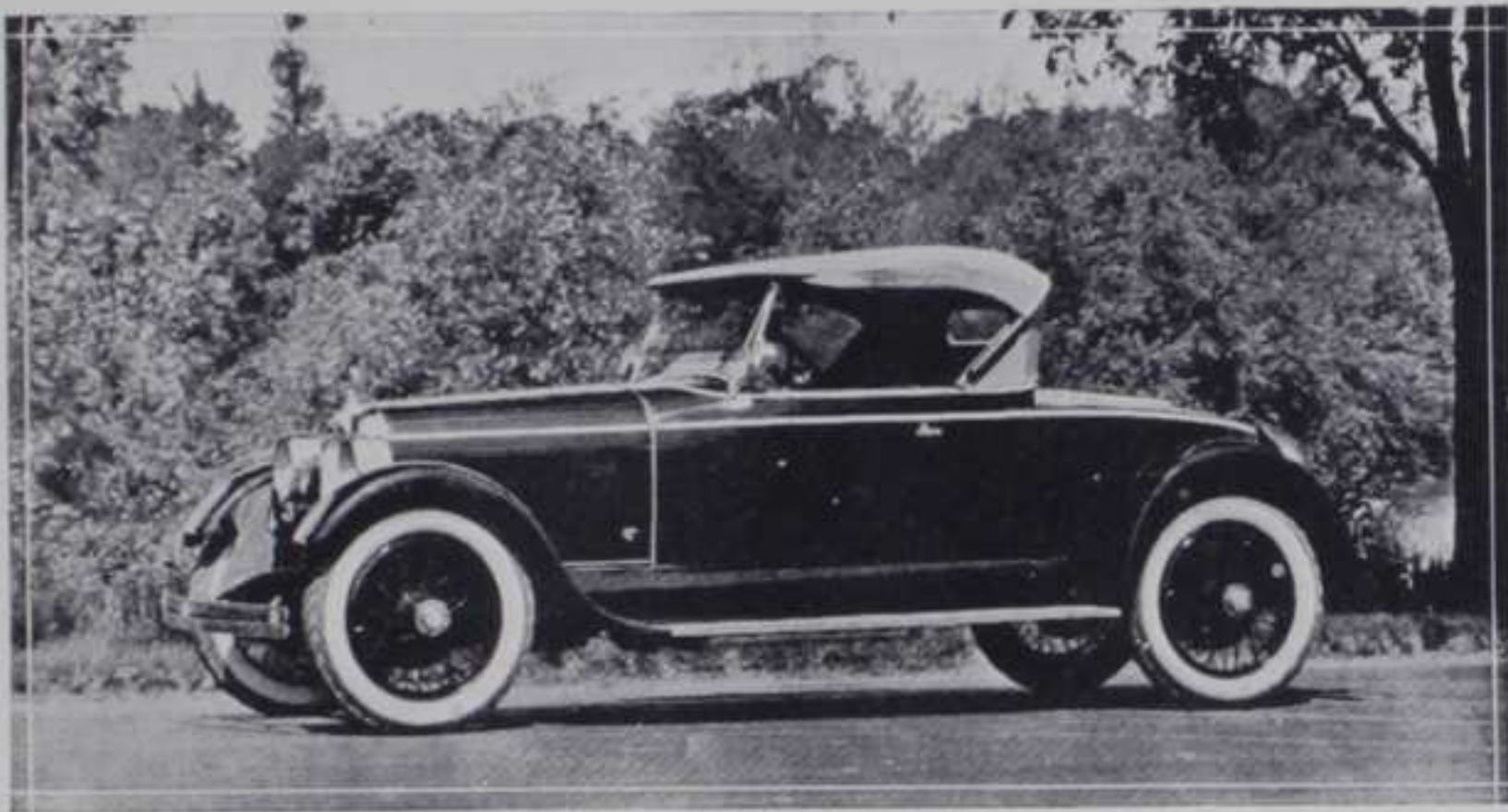




America's Finest Built  
Motor Car Equipped  
with the  
Original Straight Eight  
Motor  
and pioneer of the  
4-wheel Hydraulic Brakes

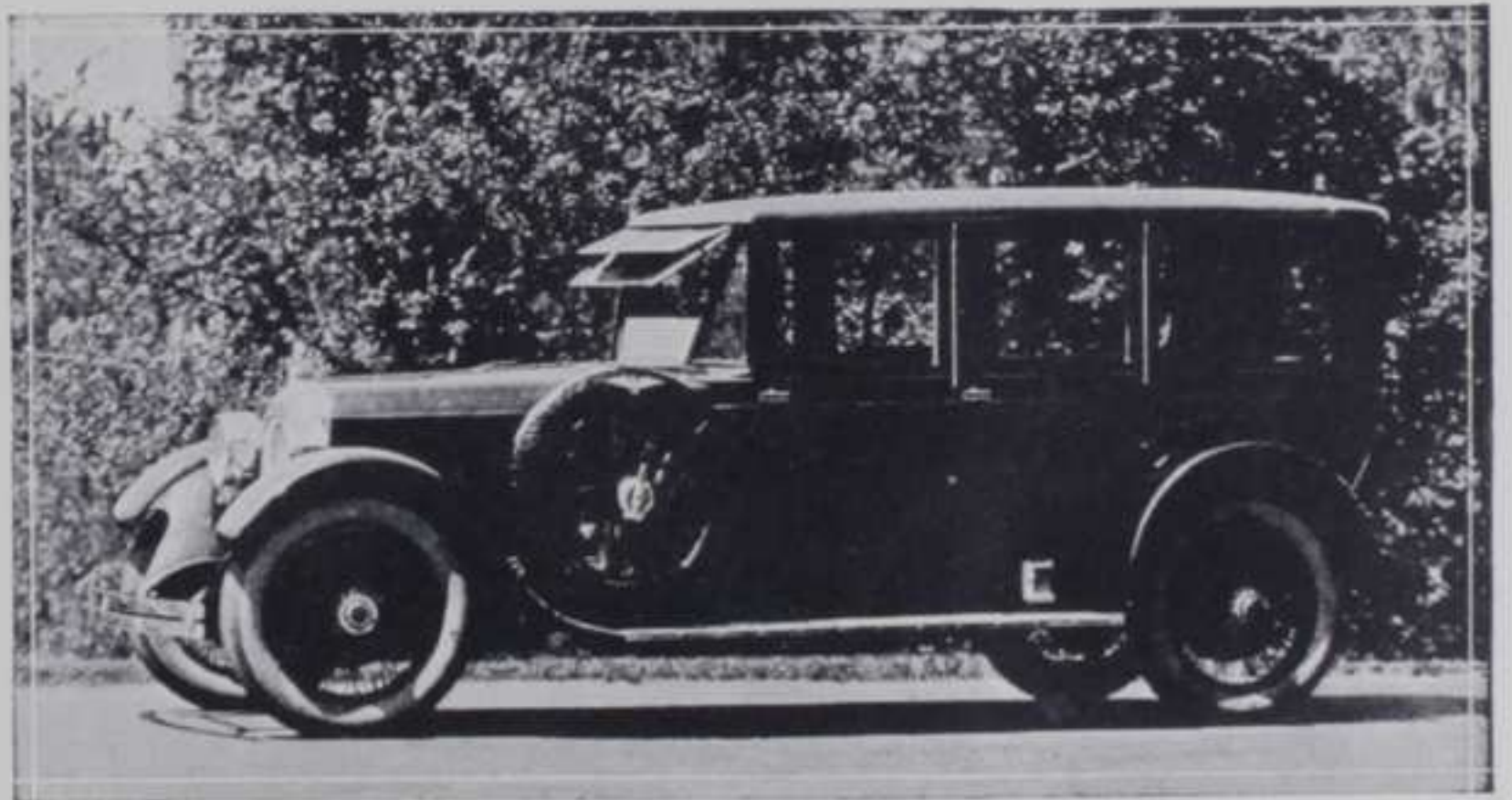


Duesenberg Straight Eight Touring Car  
Seven Passengers



The Roadster—Two Passengers

The Most Comfortable  
and Safest Automobile  
ever produced  
Built to Outclass, Outrun  
and Outlast any car  
on the road



De Luxe Limousine—Seven Passengers



*Out of the Crucible of Racing has come Commercial Perfection*







THE unusual four-wheel brakes, as well as the sensational straight eight motor idea, were incorporated in the first Duesenberg stock car four years ago. Today no stock car of prominence is without four-wheel brakes either as a standard equipment or as optional equipment. Four-wheel brakes and straight eight motors have caused more interest in automobiles than any other development since the invention of the self-starter. Today a dozen or more straight eight cars are either on the market or in the course of preparation. Much money, labor and time were spent in pioneering and perfecting the Duesenberg straight eight motors and four-wheel brakes.

Notable test achievements of the Duesenberg stock car include 18,000 miles running in twenty-one days in rain, snow and sleet storms, and a fifty-one and one-half hour run, a distance equal to a drive from New York to Los Angeles, at an average of 62  $\frac{2}{3}$  miles per hour, without a motor stop.

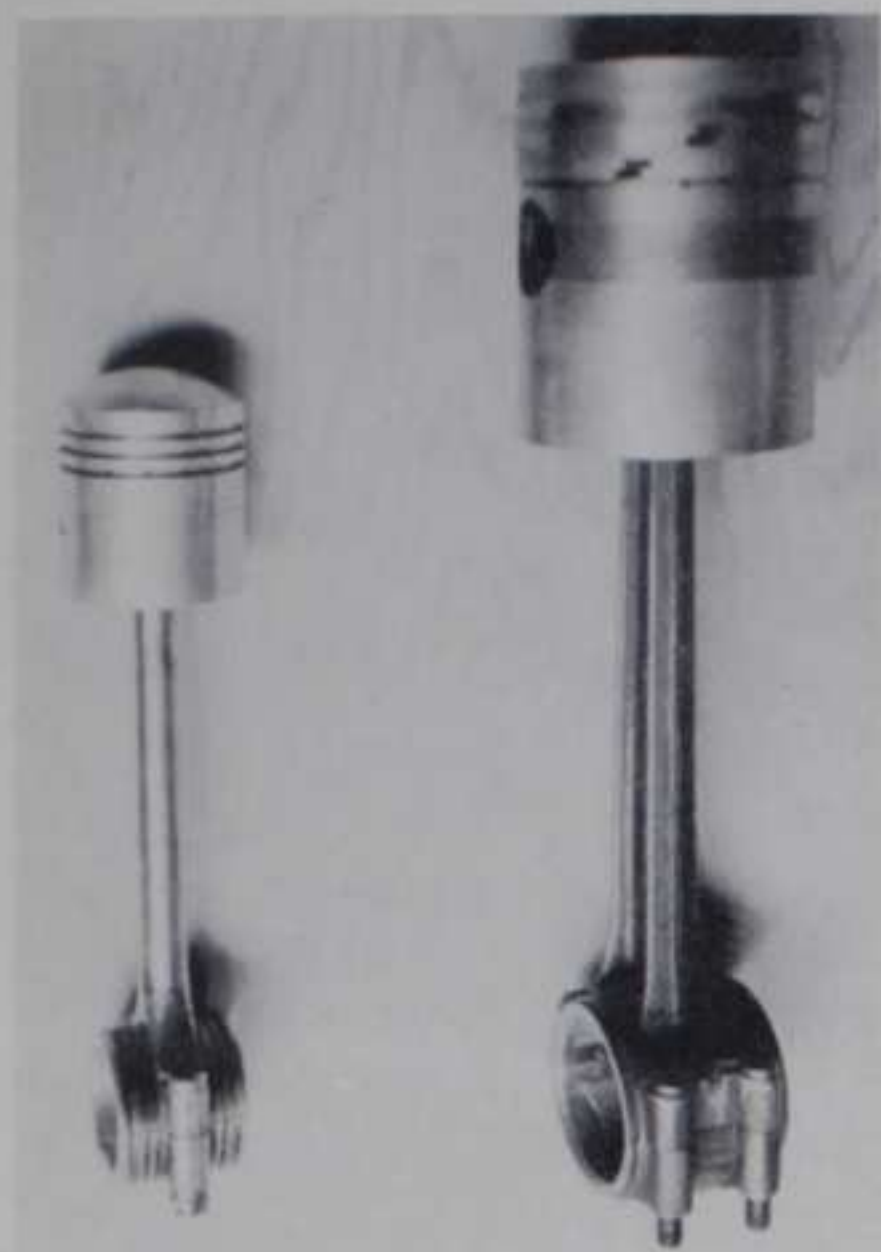
Fifteen years of road and track experience and development are responsible for the long life and easy operation, the wonderful riding qualities and performance of the present Duesenberg stock car. Many years of service and satisfaction are built into every Duesenberg. That is why the first cost is more but the ultimate cost is less. You are buying comfort and satisfaction at a lower cost than you can get in any other car, regardless of price.



*Out of the Crucible of Racing has come Commercial Perfection*







Left:  
Pistons and rods, 183 cu. in.  
and 300 cu. in.—2  $\frac{1}{4}$  lbs. and  
7  $\frac{1}{2}$  lbs.



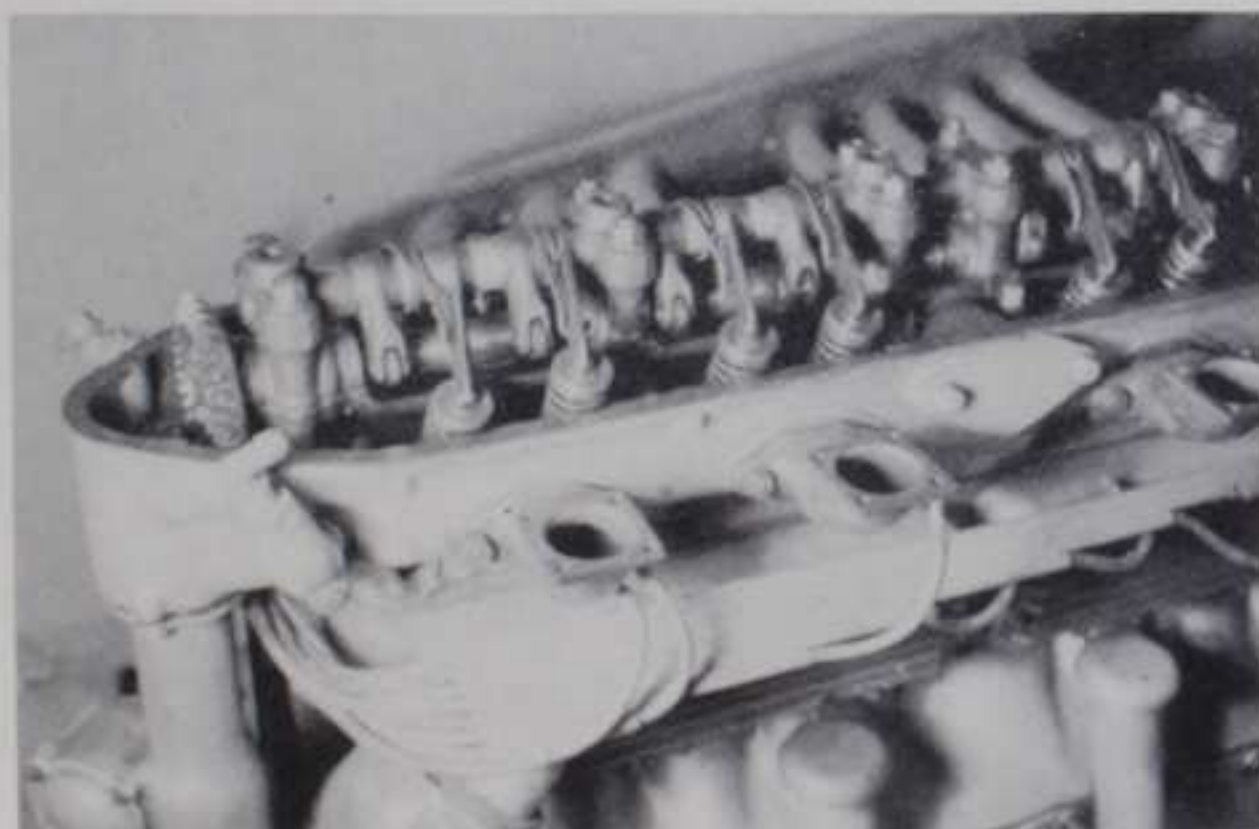
Right:  
Rocker arms—183 cu. in.  
racing engine

the horizontal valve system, but production models used the overhead camshaft.) For road use the 2  $\frac{5}{16}$ " diameter main bearings of the R-D were plain type; fan, starter, and generator were added and the four speed gearbox was in unit, behind a multiple disc clutch. The writer's Revere engine is a 300 cu. in. 4" x 6" Model G, rated 72 h.p. at 2600 r.p.m. Other models with larger bores and greater displacement developed more power. The Rochester-Duesenberg engine roared into the record book in April, 1921, when L. F. Goodspeed (aptly named!) set a stock chassis mark of 105.1 m.p.h. in a Roamer car at Daytona Beach. Goodspeed, Roamer's chief engineer, established other records of over 100 m.p.h. up to five miles. All were certified by the A.A.A.

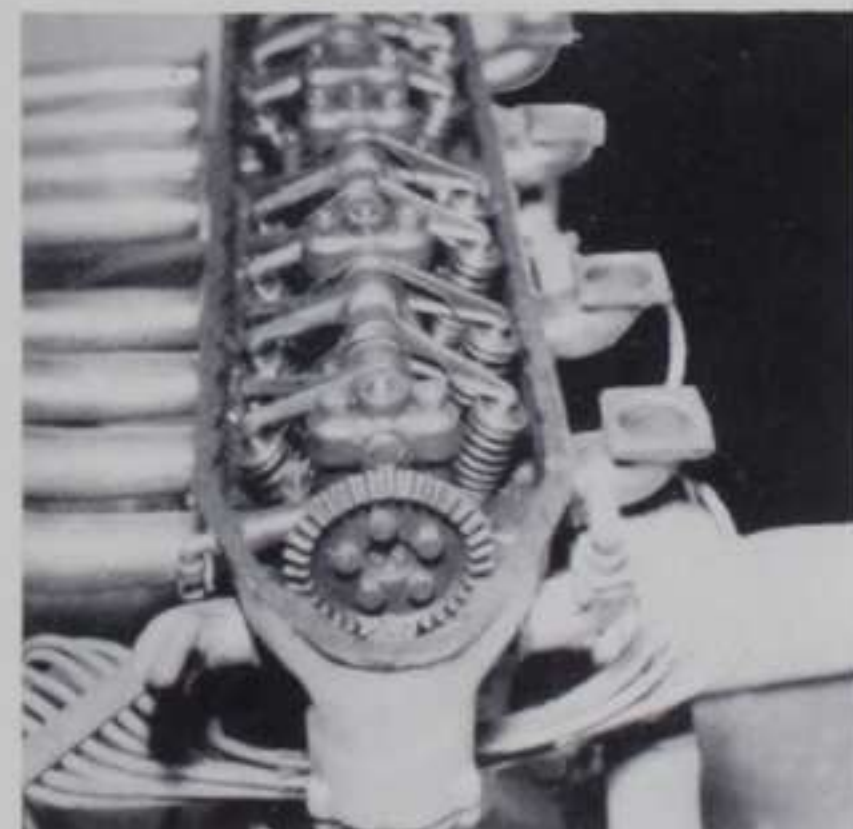
Duesenberg was a pioneer builder of straight eights in this country. Although his 300 cu. in. eights failed to finish the 1919 Five Hundred it was a different story the following year. The little 183 cu. in. Duesenberg factory entries took third, fourth, and sixth places in the 1920 classic. One failed to finish, while privately-entered cars powered by Duesenberg engines placed ninth and tenth. The 183's were impressive on the board speedways, too, then captured second, fourth, sixth and eighth places at Indianapolis in 1921. Duesenberg's reputation went sky-high with Jimmy Murphy's brilliant road race triumph at LeMans, France. The speedy San Franciscan ended the 1921 season with a Duesenberg victory on the new San Carlos, Calif., board track—111.8 m.p.h. for 250 miles, nonstop. In 1922 Murphy won the Indianapolis event in a Duesenberg, powered by a Miller engine. However, 100% Duesenbergs finished second, fourth, fifth, sixth, seventh, eighth and tenth. Aside from the semi-stock era ten years later it was one of the few times when the make was present in quantity.

The 183 cu. in. racing engine was a straight eight with a detachable head. Twenty-four inclined valves—one 1  $\frac{5}{8}$ " intake and two 1  $\frac{1}{8}$ " exhaust per cylinder—were operated by an overhead camshaft and rockers driven by a vertical shaft at the front end. Single rockers worked the intake valves on the left while double-finger arms actuated the two exhaust valves opposite. No adjustment was provided. The tubular connecting rods were finned at the

(Continued back cover)



183 cu. in. racing  
engine—1921





lower end. Only three main bearings were used; the rear was ball, the others plain. The crankcase had two inspection plates on the left side. Spark plugs were on the left side of the head, one per cylinder. The clutch and three speed box were in unit. A bore of  $2\frac{1}{2}$ " and a  $4\frac{5}{8}$ " stroke gave a displacement of 181.5 cu. in. When introduced in 1920 these three litre engines gave less than 100 h. p.; by mid-1922 continued refinements and compression ratios up to 7 to 1 resulted in 125 h.p. at 4200 r.p.m. The 183's yielded in 1923 to the smaller, single-seated 122 cu. in. models described in this booklet; these became supercharged in 1924. As the blowers had not come into use while the 183's were being raced they relied upon multiple carburetors.

To provide lower-cost race cars and to increase spectator and manufacturer interest in racing, the Indianapolis Motor Speedway Association made drastic rule changes for the 1930 race. The displacement limit was raised from 91.5 to 366 cu. in.; superchargers were banned on four cycle engines and larger cars carrying two men returned. Because of its overhead camshaft, tubular rods and axles, etc., many builders based their semi-stock race cars on the Model A Duesenberg passenger car described in this booklet. Those properly prepared ran rather well, even though pitted against the nation's costliest racing cars.

Highest finishing position by any modified stock engine in the 1930 race was gained by a Duesenberg, driven into fifth place by Bill Cummings at a 93 m.p.h. average. Prepared by Fred Duesenberg, the car used a stock block and many stock components. To permit the engine to wind up faster a new crankshaft was fitted which decreased the 5" stroke by  $\frac{3}{8}$ " and dropped the displacement from 260 to 240 cu. in. The original bore of  $2\frac{7}{8}$ " was retained. A re-designed cylinder head with improved valve action was used, as were magneto ignition and two carburetors. Despite a wheelbase of 114" and a weight of over 2100 lbs. the car qualified fourth fastest at 106.173 m.p.h. and ran the race completely free of trouble. A sister-car crashed early in the race, while a strictly-racing type Duesenberg finished sixth.

In the 1931 Five Hundred a racing Duesenberg driven by Fred Frame was second, only 43 seconds behind the winner. Duesenberg had to settle for second highest semi-stock honors; Jimmy Gleason averaged 93.605 m.p.h. for sixth position after qualifying eighth fastest at 111.400 m.p.h. A year later Ira Hall qualified seventh fastest at 114.206 m.p.h. in a semi-stock Duesenberg and finished seventh at 98.207 m.p.h. Strictly-racing Duesenbergs trailed him in eighth and ninth positions. For the 1933 Indianapolis race, Hall—still behind a modified stock Duesenberg engine—qualified tenth fastest with 115.739 m.p.h. but was eliminated early by a crash.

No automobile is perfect, and this writer does not claim perfection for the Duesenberg. But it was a most interesting and outstanding car on highway and speedway, and racing know-how became such a basic part of the passenger model that the latter was able to shine in it's own right on the Roaring Road. And, from this booklet it will be seen that the earlier and smaller Model A Duesenberg passenger car actually was very closely related to the racing models—even more so than the later, larger and more luxurious Model J Duesenbergs.

JACK CARMODY





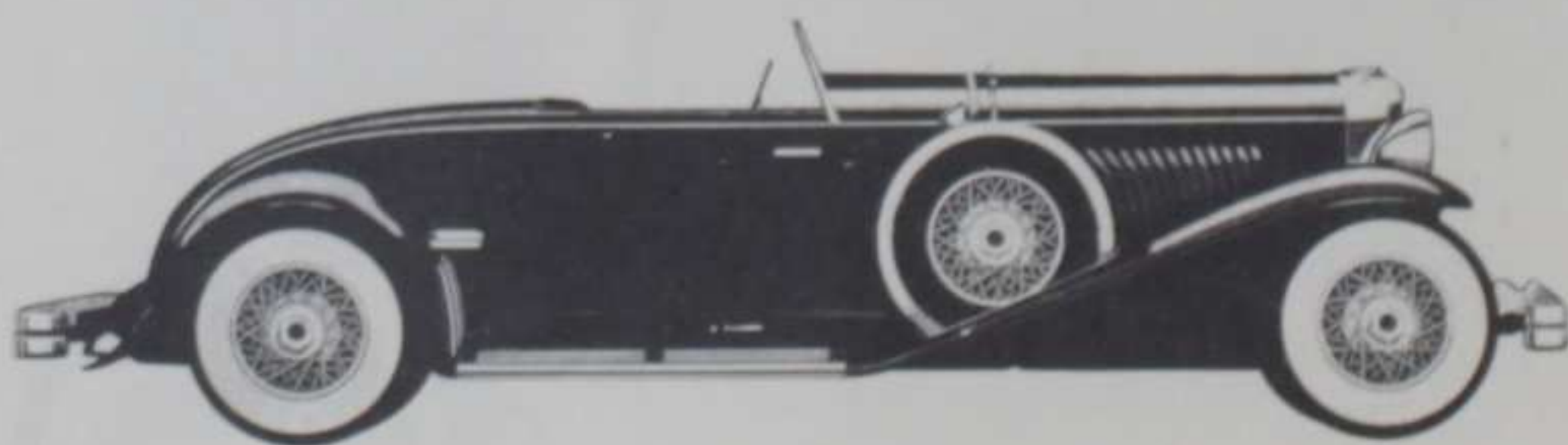
# Owner's Instruction Book

# Duesenberg

## MODEL - J

### *Announcement*

This is a reprint of an original Duesenberg Owner's Instruction Book. Owing to the continued interest in the "Duesie", one of the unique and famous cars in American history, we have made available a few of these reprints for owners, collectors, and motor car enthusiasts.— Clymer



THE DUESENBERG CONVERTIBLE ROADSTER

*Reprinted in 1951 by*

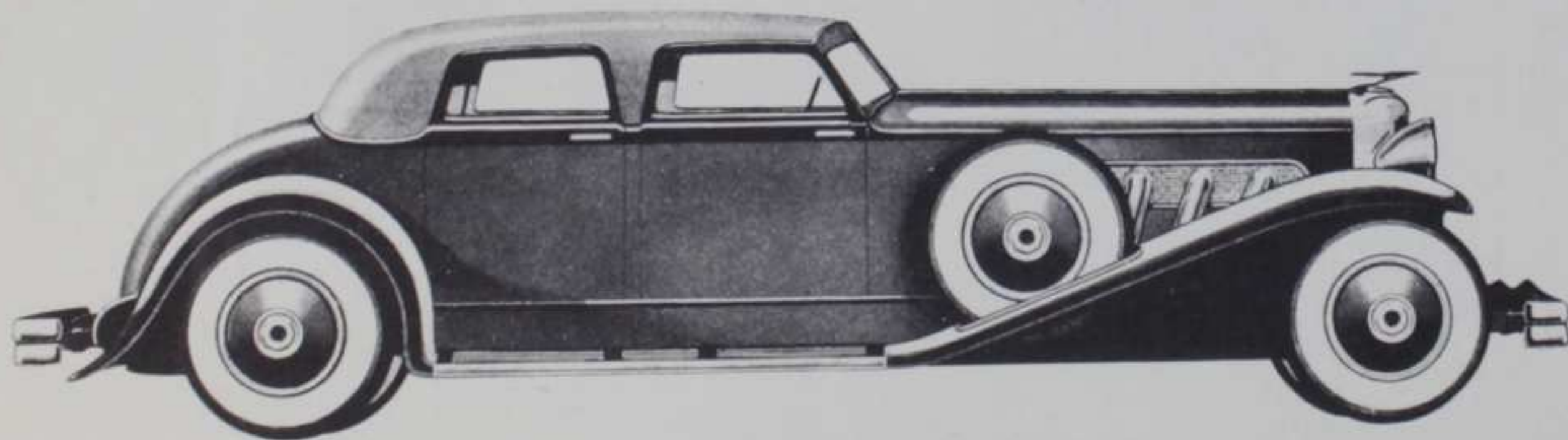
**FLOYD CLYMER**

*World's Largest Publisher of Books Relating to  
Automobiles, Motorcycles, Motor Racing, and Americana*

1268 South Alvarado Street      Los Angeles 6, California



*This stream-lined supercharged Duesenberg is not freakish in appearance. There are many designs and suggestions for you to choose from.*



320 HORSEPOWER SUPERCHARGED DUESENBERG



## *License and Insurance Data*

Number of cylinders.....	8
Cylinder bore.....	3 $\frac{3}{4}$ in.
Stroke.....	4 $\frac{3}{4}$ in.
Piston displacement.....	420 cu. in.
Horse Power (SAE rating).....	45

The car serial number will be found on front of dash upper left-hand side.

The motor number is stamped on the left rear motor support leg.

The front axle number is stamped on top flange center section of I beam.

The rear axle number is stamped on top of center section of steel housing.

## *Approximate Shipping Weights for Standard Types*

2-4 Pass. Roadster Convertible Coupe.....	142 $\frac{1}{2}$ W. B. 5250 lbs.
4 Pass. Convertible Sedan.....	142 $\frac{1}{2}$ W. B. 5550 lbs.
5 Pass. Standard Sedan.....	142 $\frac{1}{2}$ W. B. 5450 lbs.
4 Pass. Sport Phaeton.....	142 $\frac{1}{2}$ W. B. 5250 lbs.
7 Pass. Standard Sedan.....	153 $\frac{1}{2}$ W. B. 5850 lbs.
Chassis (Only).....	142 $\frac{1}{2}$ W. B. 4450 lbs.
Chassis (Only).....	153 $\frac{1}{2}$ W. B. 4550 lbs.

## *Illustrations*

1. Instruments
2. Lubricating system of motor
3. Cross-sectional view-left side of motor
4. Photograph and cross-sectional view-front of motor
5. Valve and ignition timing diagram
6. Photograph of carburetor and cross-sectional view of fuel pump.
7. Cross-sectional view of clutch, and transmission.
8. Cross-sectional view of rear axle and torque tube.
9. Cross-sectional view of front axle and external view of brake assembly
10. Master cylinder assembly
11. Plan view of chassis
12. Shackle assembly
13. Wiring diagram



## INSTRUMENTS AND CONTROLS

## (1) IGNITION SWITCH

The ignition switch located on the instrument board when turned to the right snaps out to the "on" position and closes the circuit between the storage battery and the ignition system. Thus, current is supplied for igniting the gasoline in the cylinders, which is the first step in starting the motor. Always stop the motor by turning off the ignition switch and be very careful to see that switch is never turned on when the motor is not running as the battery may be completely discharged.

## (2) THROTTLE CONTROL LEVER

The hand throttle is closed when the lever is in its upper-most position and should be opened by moving the lever downward approximately  $\frac{1}{2}$ " on quadrant for the second step in starting the motor. The speed of the motor may thus be regulated by the hand lever or foot pedal.

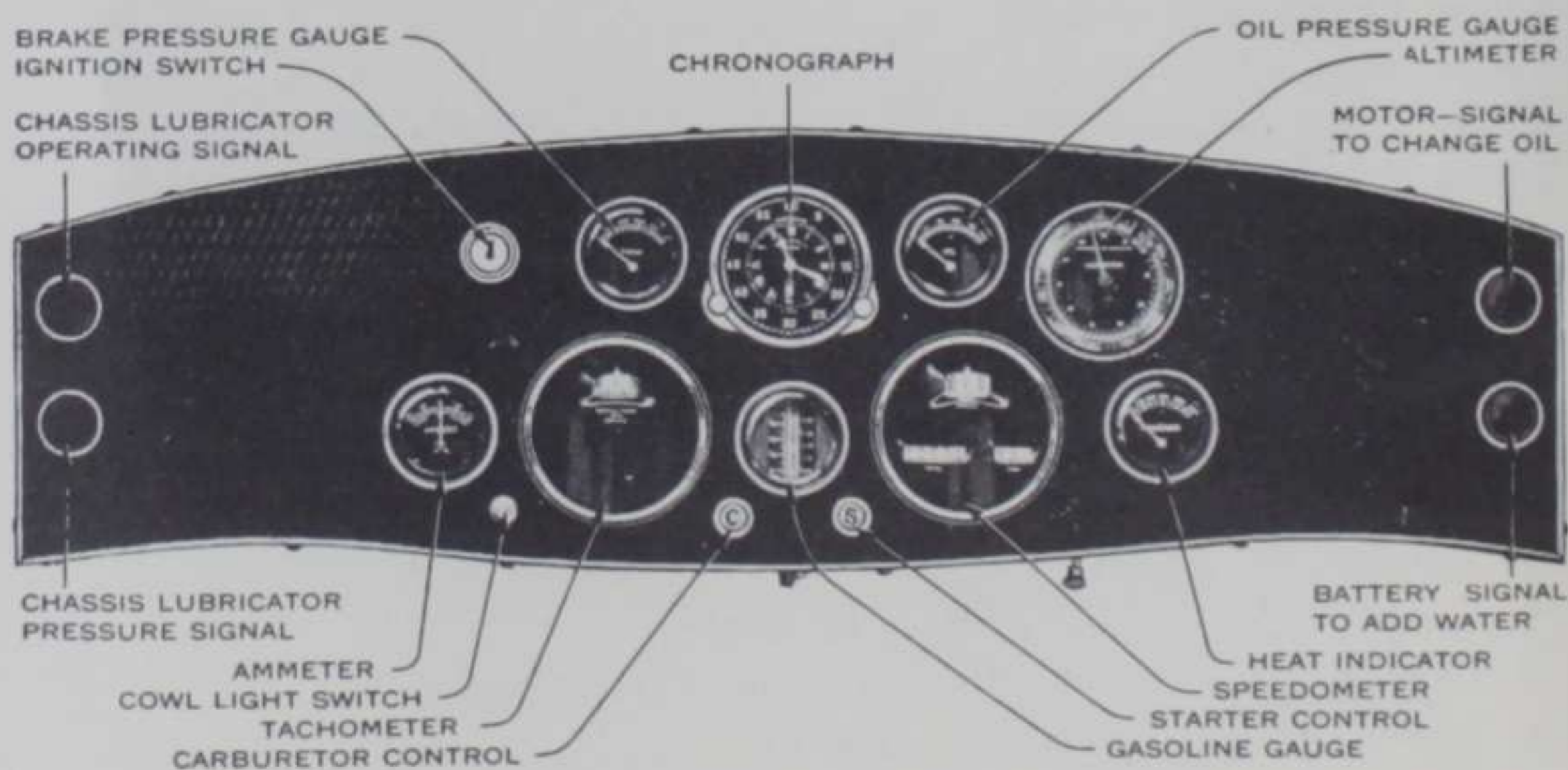


Fig. 1. Instruments

## (3) SPARK CONTROL LEVER

The ignition timing is retarded when the lever is in its uppermost position and should be moved to approximately mid position of the quadrant for the third step in starting the motor. As soon as the motor has started the ignition should be advanced by moving lever downward to position where maximum performance of the motor is obtained. Learn to regulate position of spark lever for different motor speeds, keeping it in the advanced positions for higher motor speeds and retarding it as required for maximum power at lower speeds.



#### (4) ACCELERATOR PEDAL

The accelerator pedal performs the same function as the hand throttle lever and ordinarily is used in preference to the hand lever.

#### (5) CARBURETOR CONTROL

The carburetor control is to be used for enriching the carburetor mixture as required when the motor is cold. The fourth step in starting the motor is to pull the carburetor control out as far as possible until the motor starts to fire, and immediately return it gradually to its normal position as the motor warms up. Under extremely cold weather conditions it may be necessary to leave the control pulled out approximately  $\frac{1}{2}$ " for a few minutes to give the correct carburetion until the water temperature is normal. The control should be pushed all the way in to the instrument board as the warming up process is completed to prevent excessive oil dilution and resultant cylinder wear.

#### (6) STARTER CONTROL

The engaging of the starting motor is accomplished by pulling the control button located on instrument board out as far as possible and is the fifth and last step in starting the motor. The starter should be engaged at intervals of 10-15 seconds and should not remain engaged for longer periods as this will discharge the battery rapidly. If the motor does not start after two or three attempts, an immediate investigation should be made to determine the trouble by checking the following items.

1. Gasoline supply may be exhausted.
2. Gasoline mixture may be too rich or lean. Carburetor may be choked excessively by leaving dash control out too long.
3. Open throttle approximately half way to start when motor has been choked excessively.
4. Check gasoline supply at carburetor by removing hexagon drain plug in bowl near the front on the outside. It may be necessary to remove and clean strainer bowl assembly Part No. J-1232 Fig. 3 and prime the system by operating gasoline pump by hand.
5. Be sure switch is on and check to see if electrical terminals are tight at the distributor and ignition coils back of the instrument board.
6. In cold weather depress the clutch pedal so as to eliminate the load on the starting motor of turning the transmission.
7. Check starter ground strap from starter to frame and battery terminals to see that they are absolutely tight.
8. Check battery charge.



## (7) CLUTCH PEDAL

The clutch pedal controls the operation of the clutch and releases or disengages the motor to permit shifting and engaging the transmission gears. A clearance of 1" to 1½" should be maintained between the return position of the pedal and the floor board at all times to insure proper clutch action. (See clutch). The foot should not be permitted to rest on the clutch pedal while driving as this subjects the clutch parts to unnecessary wear.

## (8) BRAKE PEDAL

The foot brake pedal operates the 4 wheel hydraulic brakes commonly known as service brakes. Application and control of brakes is accomplished by depressing the pedal in the conventional manner, the braking effect being directly proportional to amount of pressure exerted on the pedal.

## (9) GEAR SHIFT AND LEVER

The transmission is of the conventional three speeds forward with the standard universal gear shift. Due to the special design of the transmission a lightning shift of gears may be made even at high motor speeds.

## (10) LIGHT CONTROL LEVER

The lighting switch is located at the base of the steering column and is operated by the third control lever on top of steering column. Extreme position to the left is for cowl and tail lamps, next position to right all lights off and the two positions to the extreme right for headlights and tail light with the headlight beams deflected for one of the positions.

## (11) HAND BRAKE LEVER

The hand brake lever operating the emergency brake is to be used for locking car in position when parked. Form the habit of locking the brake when the car is parked.

## (12) WINDSHIELD WIPER

The windshield wiper is operated from the vacuum in the manifold and is controlled at the assembly by a thumb screw.

## (13) TACHOMETER

The tachometer is a revolution counter attached to the rear of one camshaft giving direct revolutions per minute of motor speed.



## (14) SPEEDOMETER

The speedometer instrument gives the direct reading in miles per hour up to 150, together with total and trip mileage.

## (15) CHRONOGRAPH (Clock and Split Second Stop Watch)

The clock is an eight day instrument incorporating in its movements a split second watch by the use of which actual developed speed can be figured from the specific time and distance covered.

## (16) ALTIMETER

The altimeter records barometric pressure in inches of mercury together with altitude measured in feet. The graduated scale for altitude may be shifted, thus allowing the scale to be set at zero with dial indicator whereby variations in altitude are indicated directly for different localities. By setting the altitude dial to the exact altitude of a given locality according to the corresponding barometer reading, weather conditions or changes may be approximated.

## (17) OIL PRESSURE GAUGE

The oil pressure gauge indicates the condition of the oil pressure system for the motor and gives the pressure reading in pounds per square inch. Form the habit of observing the oil gauge to see that it shows correct pressure at all times. If pressure should drop below normal, lack of oil or very thin oil may be the reason.

## (18) GASOLINE GAUGE

The gasoline gauge indicates in gallons the amount of gasoline in the tank. This gauge is calibrated or set at the factory and should require no attention thru the lifetime of the car.

## (19) BRAKE PRESSURE GAUGE

The brake pressure gauge indicates the hydraulic pressure developed upon application of the brakes or in other words the working condition of the system. The brakes ordinarily require approximately 200 pounds pressure for operation but the system is capable of developing 500 pounds pressure in emergencies; thus a high factor of safety is maintained for breaking effect in controlling the car.

## (20) AMMETER

The ammeter indicates the working condition of the electrical system or in other words the rate of charge or discharge of the battery. The ammeter should indicate a charging rate of 10-12 amperes with all lights turned off at a road speed of 20-30 M. P. H.



## (21) HEAT INDICATOR

The heat indicator gives the temperature of the water cooling system in degrees of Fahrenheit. The most efficient operating temperature is from 160-200 degrees although in extremely warm or cold climates the temperature may run slightly higher or lower.

## (22) INSTRUMENT BOARD SIGNAL LIGHTS

The green signal light at the right side marked "Bat" when burning approximately every 1500 miles reminds you that the battery should be inspected and pure distilled water added to bring the solution to within  $\frac{3}{8}$ " of top.

The red signal light at the right side marked "Oil" when burning approximately 750 miles indicates that the motor oil should be changed.

The red signal light at the left side when burning approximately every 60-80 miles indicates that the chassis lubricating mechanism is operating and immediately afterward the green signal light should flash showing that oil is being delivered to the various shackle bearings. Should the second light fail to operate check the oil supply in chassis lubricator supply tank at the right front side of the dash.

## (23) HOOD LOCK

To lock the hood properly it is necessary to place the lock control handle upright when dropping hood in position, then turn handle down in right hand direction, pushing cylinder of key lock "in" to lock control lever in down position.

Tool box and battery compartment locks operate in the same manner.

## (24) RADIATOR CAP

When removing radiator cap care should be taken to unscrew cap as far as possible before lifting from shell, otherwise cap will not return to its proper locking position when again installed.

*Paragraphs 25-29 inclusive discontinued.*



## OPERATION

In the designing and building of this car every effort has been made, to make it as complete as possible and to eliminate the many annoyances of periodic inspection and lubrication so essential to prolonging the life of the average motor car.

In furthering this motive the manufacturing division has taken all possible precautions in building and testing this car to eliminate various items of checking and preparation usually necessary upon receipt of the car at its destination.

When cars are shipped it will be necessary to check the following items.

## (30) PREPARING CAR FOR SERVICE

1. Remove spark plugs and insert approximately  $\frac{1}{2}$  oz. of cylinder oil into each cylinder.
2. Fill radiator with clean water (capacity 7 gal.) In cold weather an anti-freeze solution should be used. See paragraph 73.
3. Fill gasoline tank (capacity 26 gal.)
4. Be sure oil in crankcase is up to proper level which is indicated by oil level gauge on left side of motor. (capacity 3 gal.)
5. Check air pressure of tires, which should be 40 lbs. for front, 38 lbs. for rear.
6. Test battery with hydrometer and see that all plates are covered with water.
7. Check all lights to see that they burn properly.

## (31) RUNNING A NEW MOTOR

The most critical period in the life of the motor is the first 1000 miles of operation. Permanent injury or damage may result through the failure to observe the simple but fundamental laws of "working in" the new motor.

During this initial period of operation, additional cylinder lubrication should be supplied by adding one quart of light crystal engine oil to each ten gallons of gasoline used.

Sustained or continued high motor speeds are extremely detrimental until the motor has passed the initial 1000 miles of operation. Even after this mileage the motor should never be raced, especially when cold.

## (32) OPERATING THE CAR

Operating the car, that is, starting the motor, shifting gears, controlling and stopping the car is all accomplished in the conventional manner with which all operators are familiar. It is



therefore needless to narrate this simple procedure, but we will give a list of driving suggestions which we trust will assist in operating the car and adding comfort for its passengers.

1. Use the power of the motor and brakes moderately in controlling the car.
2. Drive with the carburetor control all the way in against the dash at all times except when starting with the motor cold. Rich mixtures cause rapid oil dilution and excessive cylinder wear.
3. Form the habit of glancing at the instrument panel. The instruments indicate the operating condition of the lubricating, electrical and cooling systems. Watch the oil gauge to see that it shows normal pressure at all times.
4. Do not ride with foot on the clutch pedal or disengage clutch when coasting down steep grades as these practices cause early service replacements and expense.
5. Leave ignition "On" when coasting. Failure to do this allows gasoline to wash the cylinder walls and thin lubricating oil, while unburnt gasses passed into the muffler may produce great damage when ignited later as the switch is turned "On".
6. Learn to regulate the spark control in relation to motor speed, driving with it in the advance position for high motor speeds and retarding it for ascending steep grades at low speeds.

### (33) INSPECTION AND LUBRICATION

In listing the items which must necessarily be checked at different intervals we have assumed that the owner is thoroughly familiar with the attention necessary to water in the cooling system, water in the battery, gasoline, oil supply in the crankcase, lights, tire pressure and the daily routine essential to successful motor car operation. However, descriptive details for the above mentioned items will be found under their respective explanations in other parts of this book.

It is imperative that the following items be checked very thoroughly at intervals of 2500 and 5000 miles.



## INSPECTION AND LUBRICATION SCHEDULE

## 2500 MILES

CHASSIS LUBRICATION—Replenish oil supply in chassis lubricator supply tank on right front of dash with Bijur special oil which may be obtained at our service stations or at Bijur Lubricating Co., 250 W. 54th St., New York City.

## 5000 MILES

COMPRESSION—Check cylinder compression by turning motor with hand crank if compression is not uniform check valve clearance.

DISTRIBUTOR—Wipe distributor head clean, inspect and adjust contact points.

TIMING—Check ignition timing.

FAN—Check fan belt adjustment.

SPARK PLUGS—Clean and adjust.

GENERATOR—Inspect coupling, commutator, and brushes, and clean them if necessary. Add 10-15 drops of oil to each bearing.

GASOLINE STRAINER—Remove and clean screens, etc.

WATER PUMP—Inspect water pump packing for leaks. Tighten packing nut if necessary.

WHEELS—Align front wheels and pack front wheel bearings with a good grade of light cup grease similar to alemite.

STEERING GEAR—Inspect for lost motion, pack gear with Whitmore's "65" lubricant, pack pivot pin bearings and tie rod joints with cup grease.

BRAKES—Adjust if necessary. Fill supply tank to within  $\frac{1}{2}$ " of top with genuine Lockheed brake fluid.

CLUTCH—Inspect for 1" to  $1\frac{1}{2}$ " free travel of clutch pedal and adjust if necessary.

AXLE-REAR—Inspect grease supply and bring to height of level plug with Whitmore's "0" lubricant.

TRANSMISSION—Inspect grease supply and bring to height of level plug with Whitmore's "0" lubricant.

BATTERY—Remove terminals, clean, grease, and tighten.

BODY BOLTS—Tighten.

AXLE SPRING CLIPS—Tighten.

SHOCK ABSORBERS—Inspect and replenish oil supply if necessary.

CHASSIS LUBRICATOR—Remove signal box pump housing cap (J-1159) Fig. 3 to clean felt and screen. Do not remove plugs in lower part of cap housing as a supply of glycerine is retained in well at this point to protect pressure switch.

Whitmore's lubricant for transmission, rear axle and steering gear may be obtained at our service station or Whitmore Manufacturing Co., Cleveland, Ohio.



## ENGINE

### (34) LUBRICATION SYSTEM

Efficient and adequate lubrication is supplied with positive pressure to all bearings and wearing surfaces of the motor. The diagram explaining the oil circulation system will be given by illustration No. 2. You will note the location of the oil pump at the lowest point in the oil sump where the oil is picked up after being filtered and screened and then discharged to the main pressure line feeding the entire system. From the main pressure line oil is first distributed to the main bearings, connecting rod bearings and piston pins, which in turn lubricate cylinder walls and piston rings. From this point in the main line a supply is also sent directly to all camshaft bearings, accessory drive shafts and idler sprockets for timing chain mechanism. The excess of oil supplied to camshaft bearings is maintained at the specific level in the camshaft housings to provide a bath of oil for all parts of the valve mechanism. Overflow or drain holes in the camshaft housing allow surplus oil to drain back into crank case and is thus kept in circulation. The oil filter located on the right side of the cylinder block is constantly filtering and removing all foreign matter in the oil supply taken from the pressure line after pressure is supplied to all units.

### (35) OIL PUMP

The oil pump is of the conventional gear type, having a capacity much greater than is actually necessary to supply an abundance of pressure at all times. The pump is driven by a vertical shaft through the side gears mounted on generator drive shaft. It is mounted to the first cross web of the cylinder block and crank case by two cap screws and is coupled to its vertical drive shaft by means of a square sleeve coupling. The main pressure line from pump to cylinder block may be disassembled after loosening tube packing lock nut. In order to remove oil pump it is first necessary to remove the oil pan and sump and then detach from its mounting.

### (36) OIL PRESSURE

The oil pressure adjustment is located on the lower left hand side of the cylinder block just in front of the oil float gauge indicator. By changing this adjustment screw and turning in a clockwise direction the pressure will be increased as indicated on the gauge on the instrument board. Turning in an anti-clockwise direction reduces the pressure accordingly. This adjusting screw is connected by a flexible cable to the relief valve sleeve in the oil pump; consequently when the adjusting screw in the block is changed you are merely increasing or decreasing spring tension on relief valve at the oil pump. The surplus oil by-passed by the relief valve is discharged directly back in the oil supply.



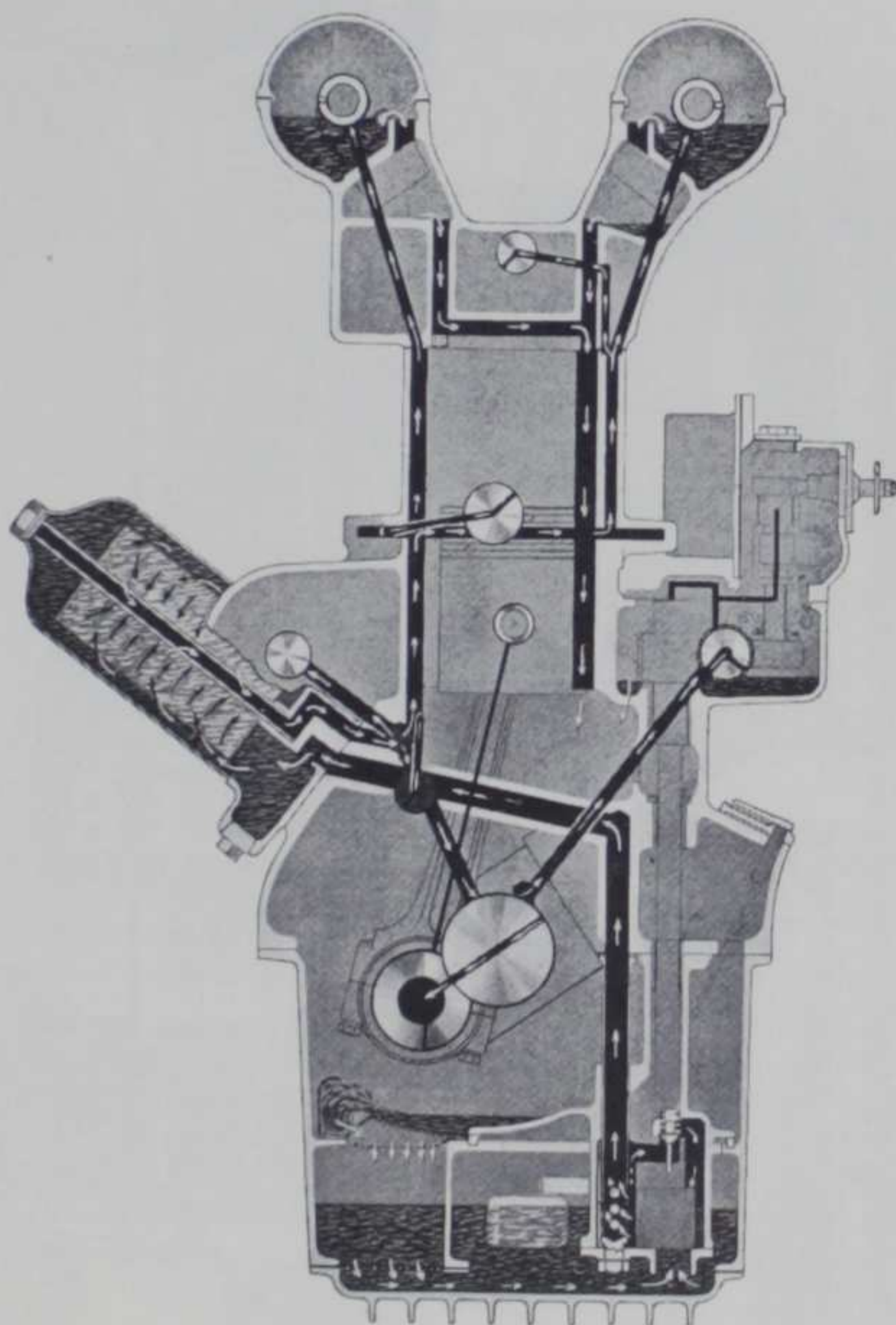


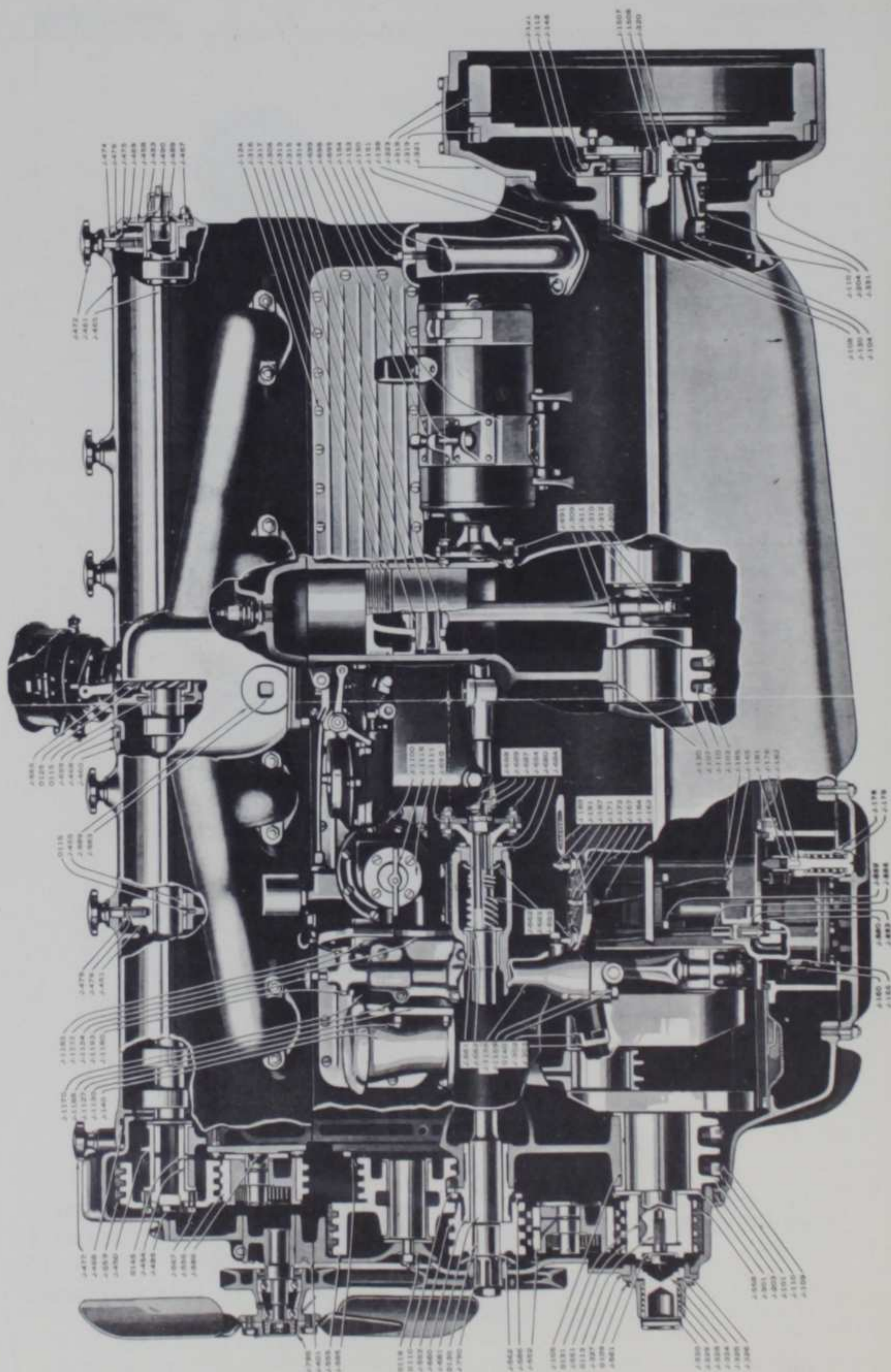
Fig. 2. Lubricating System of Motor

The correct oil pressure to be maintained at all times is approximately 2 to 10 pounds for low idling speeds and approximately one pound for every mile per hour with a maximum of 80 to 100 pounds for high speed operation. It is very essential that this correct pressure is maintained at all times.

#### (37) OIL SUPPLY AND FLOAT GAUGE

The capacity of the crankcase is 12 quarts and this supply is indicated by a float indicator gauge located at the lower front left hand side of the cylinder block.





Patented in U. S. A.

SIDE VIEW OF MOTOR

Fig. 3. Cross Sectional View Left Side of Motor



Fig. 3. PARTS DESCRIPTION

J- 101	Front main bearing cap	J- 467	Cam cover rear cap gasket
J- 103	Center main bearing cap	J- 468	Cam cover front and center packing
J- 104	Rear main bearing cap	J- 469	Cam cover rear packing
J- 105	Front main bearing bushing	J- 472	Cam cover large hand nut assembly
J- 107	Center main bearing bushing	J- 474	Cam cover large hand nut stud
J- 108	Rear main bearing bushing	J- 475	Cam cover small hand nut retainer Wire
J- 109	Main Bearing Stud	J- 476	Cam cover small hand nut retainer
J- 110	Main bearing stud nut	J- 477	Cam cover small hand nut assembly
J- 112	Rear main bearing oil retainer	J- 484	Camshaft bearing cap dowel
J- 121	Rear main bearing oil retainer Gasket	J- 485	Crankshaft plug
J- 124	Cylinder water plate screw	J- 489	Tachometer drive plug
J- 130	Main bearing bushing retainer screw	J- 490	Tachometer drive cover
J- 138	Chain case cap short screw	J- 551	Crankshaft sprocket
J- 140	Oil filler body	J- 552	Lower adjusting sprocket assembly
J- 146	Rear main bearing oil retainer screw	J- 553	Accessory shaft Sprocket
J- 150	Breather body	J- 555	Transfer sprocket assembly
J- 151	Breather body Gasket	J- 556	Upper adjusting sprocket assembly
J- 153	Breather body cap	J- 558	Lower chain
J- 154	Breather body cap screw	J- 559	Upper chain
J- 160	Oil gauge float bracket screw	J- 561	Crankshaft sprocket lock washer
J- 162	Oil gauge flexible shaft	J- 562	Gen. shaft sprocket oil slinger
J- 165	Oil gauge flexible shaft lower end	J- 567	Camshaft sprocket cap screw
J- 166	Oil gauge float bracket bushing	J- 585	Transfer sprocket assembly stud
J- 167	Oil gauge indicator	J- 586	Adjusting sprocket assembly stud
J- 171	Oil gauge face plate	J- 654	Gen. coupling disc screw
J- 172	Oil gauge indicator nut	J- 659	Distributor base
J- 176	Oil drain valve	J- 660	Generator drive shaft front bearing
J- 178	Oil drain valve body	J- 661	Generator drive shaft rear bearing bushing
J- 179	Oil drain valve spring	J- 665	Distributor control shaft
J- 181	Oil drain valve stem collar	J- 680	Gen. shaft rear housing cap screw
J- 182	Oil drain valve lift pin	J- 681	Gen. drive shaft
J- 184	Oil drain valve flex shaft upper end	J- 682	Gen. drive shaft thrust washer
J- 185	Oil drain valve flex shaft lower end	J- 683	Gen. drive shaft rear oil slinger
J- 187	Oil drain valve flex shaft packing nut	J- 684	Gen. drive shaft rear housing cap
J- 189	Oil drain valve lever	J- 687	Gen. drive coupling shaft
J- 191	Oil drain valve lever screw	J- 688	Gen. drive coupling shaft end
J- 203	Oil pan front packing	J- 689	Gen. drive coupling shaft pilot
J- 204	Oil pan rear packing	J- 691	Generator coupling
J- 300	Crankshaft	J- 695	Generator strap
J- 301	Crankshaft thrust washer	J- 698	Generator strap stud
J- 302	Crankshaft oil hole plug	J- 699	Generator strap nut
J- 303	Crankshaft oil hole plug gasket	J- 785	Fan assembly
J- 306	Connecting rod bushing	J- 790	Fan drive pulley lock washer
J- 309	Connecting rod	J- 859	Oil pump body to cylinder screw
J- 310	Connecting rod cap	J- 880	Relief valve
J- 311	Connecting rod bolt	J- 882	Relief valve spring
J- 312	Connecting rod bolt nut	J- 883	Relief valve flexible shaft assembly
J- 313	Piston	J- 886	Relief valve flexible shaft lower end
J- 314	Piston pin	J- 983	Intake manifold core hole plug
J- 315	Piston pin lock ring	J- 989	Intake manifold core hole plug gasket
J- 316	Piston compression ring	J-1012	Crankcase ventilator flange
J- 317	Piston oil ring	J-1100	Fuel pump assembly
J- 318	Fly-wheel	J-1232	Gasoline filter bowl
J- 319	Fly-wheel ring gear	J-1111	Fuel pump drive housing cover
J- 320	Fly-wheel bolt	J-1118	Fuel pump shaft handle
J- 321	Fly-wheel housing	J-1124	Fuel pump housing cover screw
J- 323	Fly-wheel cover plate	J-1127	Signal box cover gasket
J- 324	Starting jaw	J-1130	Signal box stud nut
J- 325	Starting jaw cap	J-1156	Signal box pump housing
J- 326	Starting jaw packing	J-1159	Signal box pump housing cap
J- 327	Starting jaw cap gasket	J-1170	Signal box cap
J- 328	Starting jaw spring	J-1180	Signal box pump reg. guide screw
J- 329	Starting jaw spring retainer	J-1188	Signal box car gasket
J- 330	Starting jaw pin	J-1193	Signal box pump reg. spring assembly
J- 331	Fly-wheel housing cap screw	J-1507	Clutch pilot bearing
J- 401	Cylinder head gasket	J-1508	Clutch pilot bearing retainer
J- 450	Camshaft front bearing cap	0113	Hex. head cap screw
J- 451	Camshaft inter bearing cap	0115	Flat head machine screw
J- 453	Exhaust camshaft center bearing cap	0119	Plain cut washer
J- 454	Camshaft front bearing bushing	0125	Tapper pin
J- 455	Camshaft inter bearing bushing	0130	Woodruff key
J- 458	Camshaft rear bearing bushing	0131	Woodruff key
J- 460	Intake cam front cover	0113	Hex head cap screw
J- 461	Intake cam rear cover		
J- 465	Intake cam rear cover gasket		



## (38) CHANGING OIL

This quantity of oil should be maintained in the crankcase at all times and drained, to be replaced, after 750 miles as indicated by operation of the signal light on the instrument board marked "Oil". Never flush motor with kerosene or flushing oil as it is impossible to remove a portion of this fluid which will remain in the different reservoirs. Ten drops of light engine oil should be added to generator shaft bearings at the same time motor oil is changed. The oil filter on the right hand side of the cylinder block contains a mesh covered cartridge, which removes and retains all sludge and foreign material found in the oil. This filter should be disassembled and cleaned thoroughly with gasoline at 10,000 miles and after 20,000 miles it is advisable to replace this cartridge. The filter may be completely disassembled after removing large hex nut on top.

## (39) OIL SPECIFICATIONS

It is not possible to use the same grade of engine oil for all seasons of the year except in extremely mild climates.

An "extra heavy" grade of oil should be used for the warm seasons with specifications as follows:

Viscosity at 100° F	1421 Saybolt
Viscosity at 210° F	105 Saybolt
Flash	455° F
Cold Test	16° F

This grade of oil may be obtained in many nationally advertised brands and is classified in most cases as "extra heavy" or S. A. E. specification No. 60. Use only the very best oil obtainable.

For the winter months the next lightest grade should be used which is S. A. E. No. 50 or where the cold weather is extremely severe S. A. E. No. 40 oil may be desirable.

## (40) CRANKSHAFT

The crankshaft is one of the vital factors contributing to the smooth and uniform flow of power at all speeds. The shaft, machined on all surfaces, is balanced statically to within one-onehundredth of an ounce and then given a dynamic balance with the same limits for all motor speeds. Further than this, cartridges or tubes partially filled with mercury are attached to the cheek of the shaft; the shifting of the mercury in the tubes thus eliminating even the slightest variation in power impulses.

The shaft of chrome-nickel-manganese steel has eight connecting rod throws and five main journals of ample size with extremely large connecting cheeks giving a positive alignment and rigidity under all loads. The center four connecting rod bearings are in one plan, at right angles "90 degrees" to the two end pairs. Oil supplied at the main bearing journals is transmitted to the connecting rod bearings through holes drilled in the cheeks of the shaft, where an enlarged chamber pockets any sludge that may be present in the oil and thus gives absolutely clean oil to the bearings.



## (41) MAIN BEARINGS

Five main bearings with a large diameter of  $2\frac{3}{4}$ " lined with "Mogul Genuine" bearing metal support the crankshaft. Main bearings are fitted with .0015" clearance to allow a full cushion of oil for supporting the shaft. End thrust is taken at the front main bearing and held to .0015" limit. No shims are provided for tightening bearings as this operation should not be necessary in the life of the motor. However bearings may be tightened by removing each lower half using very fine emery cloth on a surface plate to remove desired amount of metal from the top faces of cap. Be sure to tighten bearing cap nuts securely.

## (42) CONNECTING RODS

The connecting rods made of duralumin using a steel cap, provide a very light and strong unit, adding greatly to the efficiency of the engine. Rod bearings with a large diameter of  $2\frac{7}{16}$ " are lined with "Mogul Genuine" bearing metal and fitted with .0015"—.002" clearance. One web of the I-beam section of the rod is gun-drilled to provide oil pressure to piston pin bushings. No shims are provided for tightening bearings as the shims will not allow correct alignment of lower half with upper half of rod. Also it ordinarily is unnecessary to tighten bearings in the life of the motor but may be accomplished in the same manner as explained in the previous paragraph for the main bearing. Be sure cap nuts are anchored securely.

## (43) PISTON, PINS, RINGS

The pistons used are made of extremely light aluminum alloy, the design of which allows and maintains uniform expansion of the skirt with the cylinder walls for all motor temperatures. The skirt of the piston is separated from the head on the circumference, thus causing heat to be dissipated from the head of the piston into the pin bosses and connecting rods before the skirt has received only  $\frac{1}{3}$  the amount of heat normally transmitted by other conventional designs. Pistons are fitted with .0025"—.003" clearance and maintain this clearance through many thousand miles of operation. Four piston rings are used; three compression  $\frac{1}{8}$ " wide, one double duty oil regulating ring  $\frac{3}{16}$ " wide. Rings are fitted with .014" to .016" end clearance.

A hollow piston pin  $1\frac{1}{16}$ " in diameter floats in the piston pin or connecting rod bushing and is locked in the piston by means of two steel snap rings at each end. The pin is given a just free fit in the bushing and a slight driving fit in the piston.

## (44) CYLINDER BLOCK—CRANKCASE

The eight cylinders are cast en bloc with the upper half of the crankcase using a detachable cylinder head. The material of block



is chrome-nickel casting, giving long wearing life to cylinder bores. All cylinder barrels are water-jacketed for the full circumference and the entire length. Aluminum cover plates enclose the water jackets on both sides of the block to provide a protection to casting in case of freezing.

Connecting rod and piston assemblies may be removed from the bottom of the block by rotating crankshaft during the operation

#### (45) OIL BASE—LOWER HALF OF CRANKCASE

The oil base is an aluminum casting with long deep cooling fins on the underneath side. Two breathers mounted on the left side of the cylinder block provide additional ventilation for cooling the oil supply in the crankcase. A baffle pan and fine mesh screen at a height of  $2\frac{1}{2}$ " covers the entire inside area of the oil base giving a large surface for removing foreign material in oil supply before entering the pump. It is not necessary to remove screen for cleaning when changing oil, but should be done if oil base is removed at any time. To remove crankcase it is necessary to remove, screws anchoring mud pans on top flange,  $3\frac{1}{8}$ " cap screws underneath anchoring top flange to cylinder block,  $5\frac{3}{8}$ " cap screws underneath bolting rear flange to flywheel housing.

A large circular plate is located in the bottom which may be removed for inspection of the oil pump, oil drain valve and oil float gauge.

#### (46) FLYWHEEL

The flywheel is a steel forging  $14\frac{15}{16}$ " in diameter completely machined on all surfaces. A hardened steel ring gear with 119 teeth is shrunk on the flywheel to engage with the starting motor. Twelve  $\frac{7}{16}$ " bolts and nuts unevenly spaced anchor flywheel to crankshaft flange so that it is impossible to assemble the flywheel to the shaft in the wrong position. Markings on the flywheel indicate top centers for both No. 1 and No. 8 in this manner: 1 and 8, TOP. Marks appear before and after center to give reference for ignition and valve timing which is given in inches and degrees before or after center.

#### (47) CYLINDER HEAD

The cylinder head is a chrome nickel casting carrying the valve mechanism and overhead camshafts directly above the valves. The head is removable and may be detached from the cylinder block by removing upper chain cover, chain driving camshafts, cylinder head stud nuts accessories etc., as explained under "Carbon and Valves". Water passages encircle valves and spark plug chambers on all sides, giving positive and abundant cooling for all parts even for the most severe conditions. Two intake and two exhaust valves are used to give increased power by permitting a full charge



of fresh gas to enter the combustion chamber and then expelling it through the large area thus eliminating the necessity of excessive heat being passed over single valves, as takes place in conventional cylinder combustion design.

#### (48) VALVE MECHANISM

The valves are mounted at 35 degree angles to vertical center line of cylinder head with camshaft mounted directly above and operating valves through sleeve tappet between shaft and valve. Excess oil supplied to camshaft bearings under pressure is trapped in the camshaft housing and maintained at a level above tappets to provide an oil bath for valve tappets, guides and contact of tappet against cam. An oil vapor thus passes through tappet assembly to lubricate valve stem and guide beneath. Consequently a very quiet and trouble-free valve operation is maintained at all times.

#### (49) VALVES

Intake valves are made of chrome-nickel steel, with  $1\frac{1}{2}$ " diameter head,  $11/32$ " diameter stem and 30 degree seat.

Exhaust valves are made of silichrome steel with  $1-7/16$ " diameter head,  $11/32$ " diameter stem and 30 degree seat.

#### (50) VALVE TAPPETS AND TAPPET GUIDES

Valve tappet guides are a just free fit into cylinder head and anchored in pairs by means of two clamps each. A clearance fit of .0015 inches between tappet and guide is maintained at all times using a special steel for both units.

#### (51) VALVE ADJUSTMENT

Adjustment of valves is provided by adjusting nut (J-420, Fig. 3 and adjusting sleeve J-421, Fig. 3). This adjusting nut assembly makes contact between end of valve stem and underneath surface of tappet. Shims of the desired thickness are assembled between adjusting nut and sleeve to give the required clearance of .022" between the tappet and camshaft. An ordinary thickness or feeler gauge may be used for checking clearance between tappet and heel of cam, while 1-inch micrometers will be needed for checking thickness of adjusting nut to give correct clearance by addition or removal of shims in nut. In order to perform the operation of adjusting valves, it is first necessary to remove camshaft covers, upper chain cover, upper chain, distributor, camshafts, tappets, etc., to give access to adjusting nuts directly on top of valves. Be sure to check tappet clearance with feeler gauge for each valve before removing camshaft and make pencil notes of all settings in order to be able to change adjusting nut thickness to the desired dimension and thus obtain correct clearance.



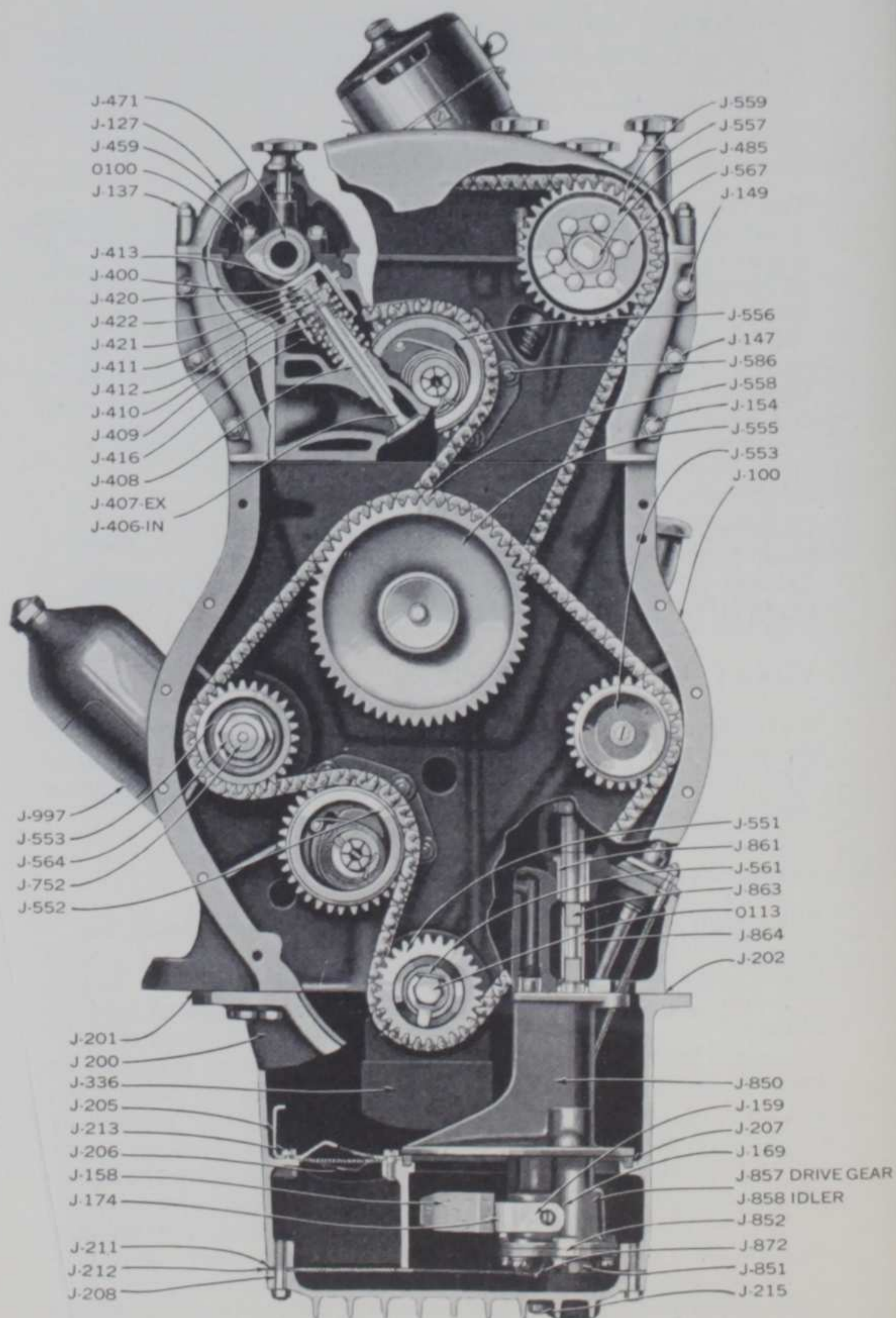


Fig. 4. Cross Sectional View Front of Motor



Fig. 4. PARTS DESCRIPTION

J- 100	Cylinder block	J- 420	Valve tappet adjusting nut
J- 127	Chain case cap	J- 421	Valve tappet adjusting sleeve
J- 137	Chain case cap long screw	J- 422	Valve tappet adjusting shim
J- 147	Chain case upper cover dowel screw	J- 459	Camshaft bearing stud
J- 149	Chain case upper cover long screw	J- 471	Exhaust camshaft
J- 154	Breather body cap screw	J- 483	Camshaft plug
J- 158	Oil gauge float	J- 551	Crankshaft sprocket
J- 159	Oil gauge float bracket	J- 552	Lower adjusting sprocket assembly
J- 169	Oil gauge bevel gear	J- 553	Accessory shaft sprocket
J- 174	Oil gauge float assembly	J- 555	Transfer sprocket assembly
J- 200	Oil pan	J- 556	Upper adjusting sprocket assembly
J- 201	Oil pan R. H. gasket	J- 557	Camshaft sprocket
J- 202	Oil pan L. H. gasket	J- 558	Lower chain
J- 205	Oil pan baffle plate	J- 559	Upper chain
J- 206	Oil pan screen	J- 561	Crankshaft sprocket lock washer
J- 207	Oil pan to oil pump packing	J- 564	Water pump shaft sprocket lock nut
J- 208	Oil pan strainer body	J- 567	Camshaft sprocket cap screw
J- 211	Oil pan strainer body gasket	J- 586	Adjusting sprocket assembly stud
J- 212	Oil pan strainer screen assembly	J- 752	Water pump drive shaft
J- 213	Oil pan baffle plate screw	J- 850	Oil pump body
J- 215	Oil pan strainer body long stud	J- 851	Oil pump cover
J- 336	Crankshaft small counterweight	J- 852	Oil pump cover gasket
J- 400	Cylinder head	J- 857	Oil pump gear
J- 406	Intake valve	J- 858	Oil pump idler gear
J- 407	Exhaust valve	J- 861	Oil pump drive shaft lower bushing
J- 408	Valve guide	J- 863	Oil pump drive shaft
J- 409	Inner Valve spring	J- 864	Oil pump drive shaft coupling
J- 410	Outer valve spring	J- 865	Oil pump shaft
J- 411	Valve spring retainer	J- 867	Oil pump shaft lower bushing
J- 412	Valve spring retainer wedge	J- 872	Oil pump pressure tube nut
J- 413	Valve tappet	J- 873	Oil pump pressure tube lower gasket
J- 416	Valve tappet guide	J- 874	Oil pump pressure tube lower washer
J- 418	Valve tappet guide clamp stud	J- 997	Oil filter assembly
		0100	Plain hex nut 5/16" - 24
		0113	Hex head cap screw 1/2" - 20 - 1 1/4"

## (52) VALVE GUIDES

The valve guides are special steel with press fit in cylinder head and a ream clearance fit of .001" for valve stem.

## (53) VALVE SPRINGS AND RETAINERS

The valve springs are made of the best grade electric furnace steel available; two springs being used for each valve and assembled in the conventional manner using aeroplane type retaining washer locks to anchor retaining washer to valve stem. The retaining washer lock is in two halves with outside tapered diameter resting in retainer washer and clamping valve stem at the three ring groove.

## (54) CAMSHAFT AND BEARINGS

The camshafts are made of special steel and supported by five bearings each 1 1/4" in diameter. The bearings are lined with "Mogul Genuine" bearing metal and given a clearance fit of .0015" for camshaft journals. End thrust is taken at front bearing maintained at .002" to .003". Valve lift for intake shaft is .350" and .360" for exhaust.

## (55) TIMING CHAIN

Two endless silent timing chains with automatic adjustment are used to drive camshafts and accessory shafts. The lower chain part number J-558, Fig. 3, 2 inches wide and approximately 47



inches in length with  $\frac{3}{8}$ " pitch drives the generator shaft, water pump shaft, and transfer sprocket for upper chain. The automatic idler sprocket part number J-552, Fig. 3, retains the correct amount of tension on the chain at all times by means of its spring loaded hub and automatically adjusts the chain for wear. The chain may be removed after first removing chain cover and then disassembling automatic idler as explained under "Valve Timing" for the upper chain. The lower chain may be assembled in mesh for any position on all sprockets.

The upper chain, J-559, Fig. 3,  $1\frac{11}{16}$  inches wide and approximately 52 inches in length with a  $\frac{3}{8}$ " pitch drives the two camshafts from driven transfer sprocket of lower chain. An automatic idler J-556, Fig. 3, maintains the correct tension which automatically compensates for wear. Oil pressure supplied to idler sprockets provide an oil bath for the complete chain mechanism. To remove upper chain first disassemble adjusting idler sprocket. Remove cotter pin and plain washer then with screw driver or thin tool pry forward the sprocket bushing and spring assembly J-574 until spring is almost ready to slip out of the notch in mounting shaft. With special tool part No. J-7016, release tension of spring from notch and pull forward, then allowing the spring to unwind. The idler sprocket may then be removed and the chain lifted off camshaft sprockets. The lower chain may be removed in the same manner after removing covers, etc. In assembling upper chain to sprockets as when setting the valve timing be sure to keep chain taut in the pull direction at all times. Assemble idler sprocket and bushing using special tool to center spring and bushing assembly setting spring with twelve notches or two complete turns. Turn motor with starter to allow chain to assume normal position and reset the tension on spring to 9 notches or  $1\frac{1}{2}$  turns.

## (56) VALVE TIMING

The valve timing may be checked or reset as outlined in Fig. 5. In order to check timing first remove inspection plate on top of flywheel, exhaust cam cover and front intake cam cover. Rotate crankshaft with pry-bar through inspection plate hole against teeth of flywheel ring gear until crankshaft is on top center for Number 1 and 8 cylinders determined by markings on flywheel as follows No. 1 and 8 Top. Remove distributor head and with spark control advanced note if the main rotor arm is in correct position to fire No. 8 cylinder as explained in Fig. 5. If its position is incorrect rotate crankshaft one complete revolution to bring distributor in firing position for number 8 cylinder when No. 1 intake and exhaust cams are downward as illustrated.

With pry-bar through inspection hole in flywheel housing rotate crankshaft backwards approximately 6 inches on the flywheel and rotate forward until intake valve No. 1 is starting to open. The No. 1 and 8 center line on the flywheel should be just  $\frac{3}{8}$ " ahead of center line on flywheel housing.



A straddle clamp should be used to clamp and twist tappet J-413 as the crankshaft is rotated to determine the exact time when the camshaft contacts to open valve. Turn flywheel ahead and with clamp on exhaust valve tappet J-413 the valve should close, or the tappet release, when No. 1 and 8 center line is  $1\frac{1}{4}$ " past center line of flywheel housing. The valve clearance should be .023" to .025" to give this timing.

To change or set timing it is necessary to remove upper timing chain cover, radiator, fan, and disassemble chain mechanism as explained under "Timing Chain".

In reassembling chain and sprockets to give the correct timing it will be necessary to remove the six  $\frac{5}{16}$ " capscrews and shift timing chain sprockets on each camshaft in order to obtain the correct timing with respect to crankshaft. A block of wood should be wedged between chain on transfer sprocket and case to prevent chain dropping down at this lowest point. The flywheel should be set within  $\frac{1}{4}$ " of the respective points for setting camshaft to allow for the slack in the chain. The chain should be kept taut at all times in assembling.

When valve timing is changed it is obvious that the ignition timing should be checked and set as explained under "Ignition Timing".

## (57) VALVE GRINDING

Procedure for grinding valves.

1. Remove hood.
2. Remove radiator. (Remove brace rods, radiator hose connections, hold down nuts, and lift radiator directly upwards).
3. Remove fan. (Remove eccentric locking bolt in cover and pull fan forward from its mounting.)
4. Remove camshaft covers upper chain cover, distributor and control, spark plugs and wires, tachometer cable at rear of intake camshaft, heat indicator line and bulb in water manifold, water manifold, exhaust manifold, intake manifold, carburetor, exhaust heat connection across cylinder block, etc.
5. Disassemble upper chain as explained under "Timing Chain".
6. Remove cylinder head stud "acorn" nuts.
7. Assemble special eye bolts and hooks to spark plug holes to provide anchors for hoist in lifting cylinder head.
8. After head is removed and placed on bench, camshaft, valve tappets, springs and valves may be removed. A special tool part No. J-7017 should be used in depressing valve springs for removing valves.
9. An improvised rack should be made for carrying tappets, adjusting nuts, and valves and so marked in order to reassemble these parts in their original location. Failure to



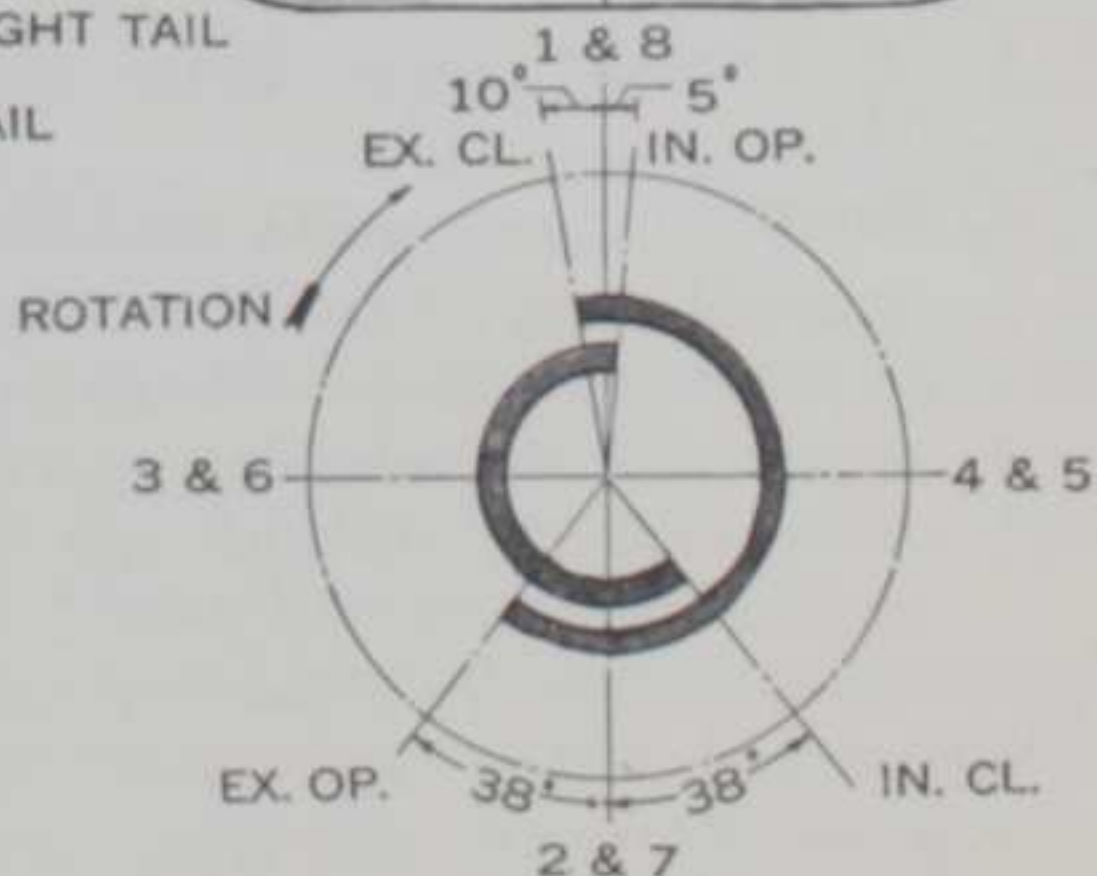
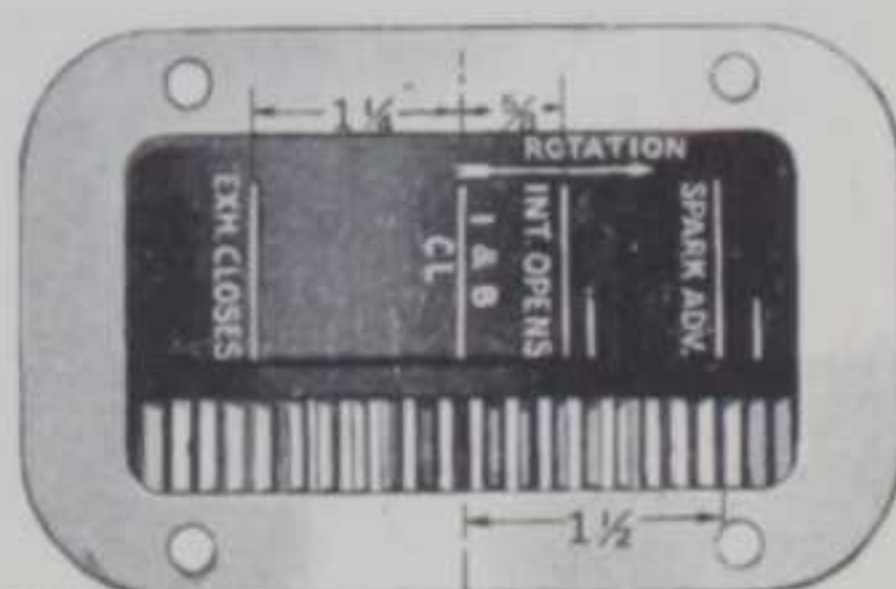
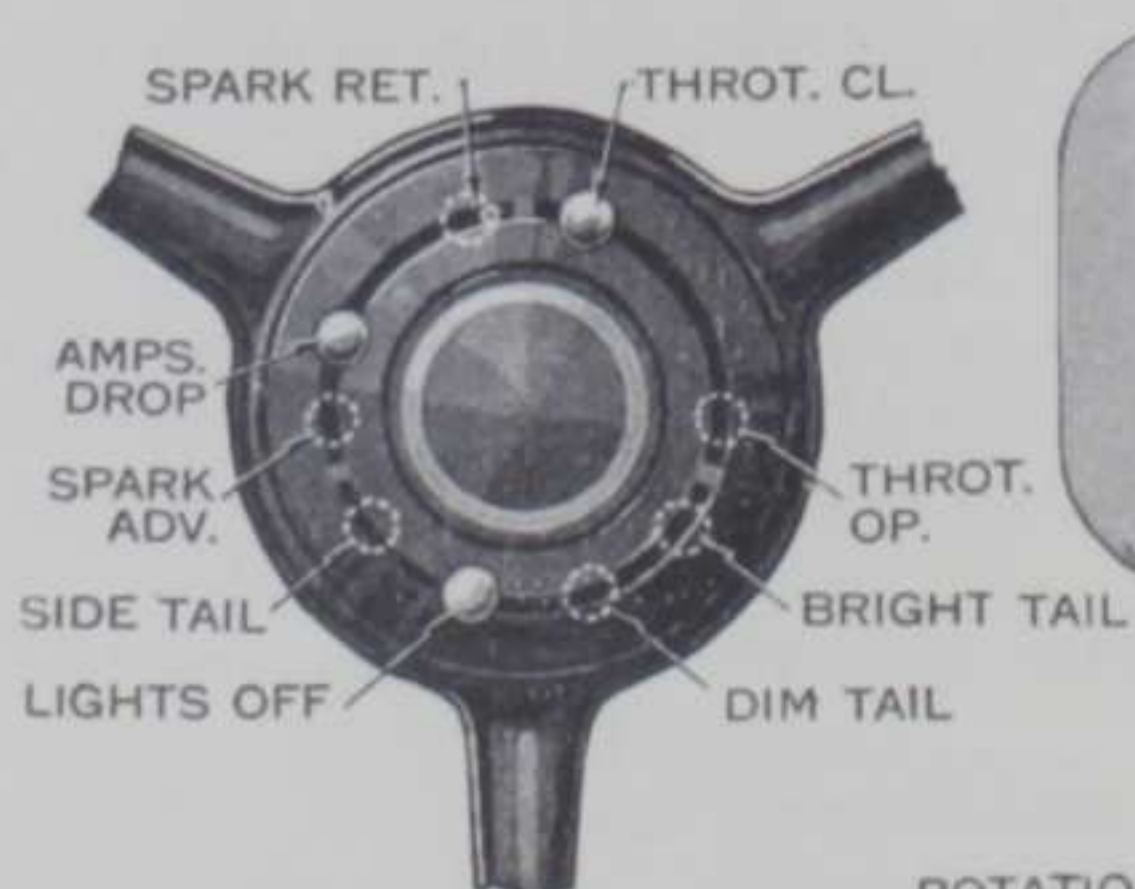
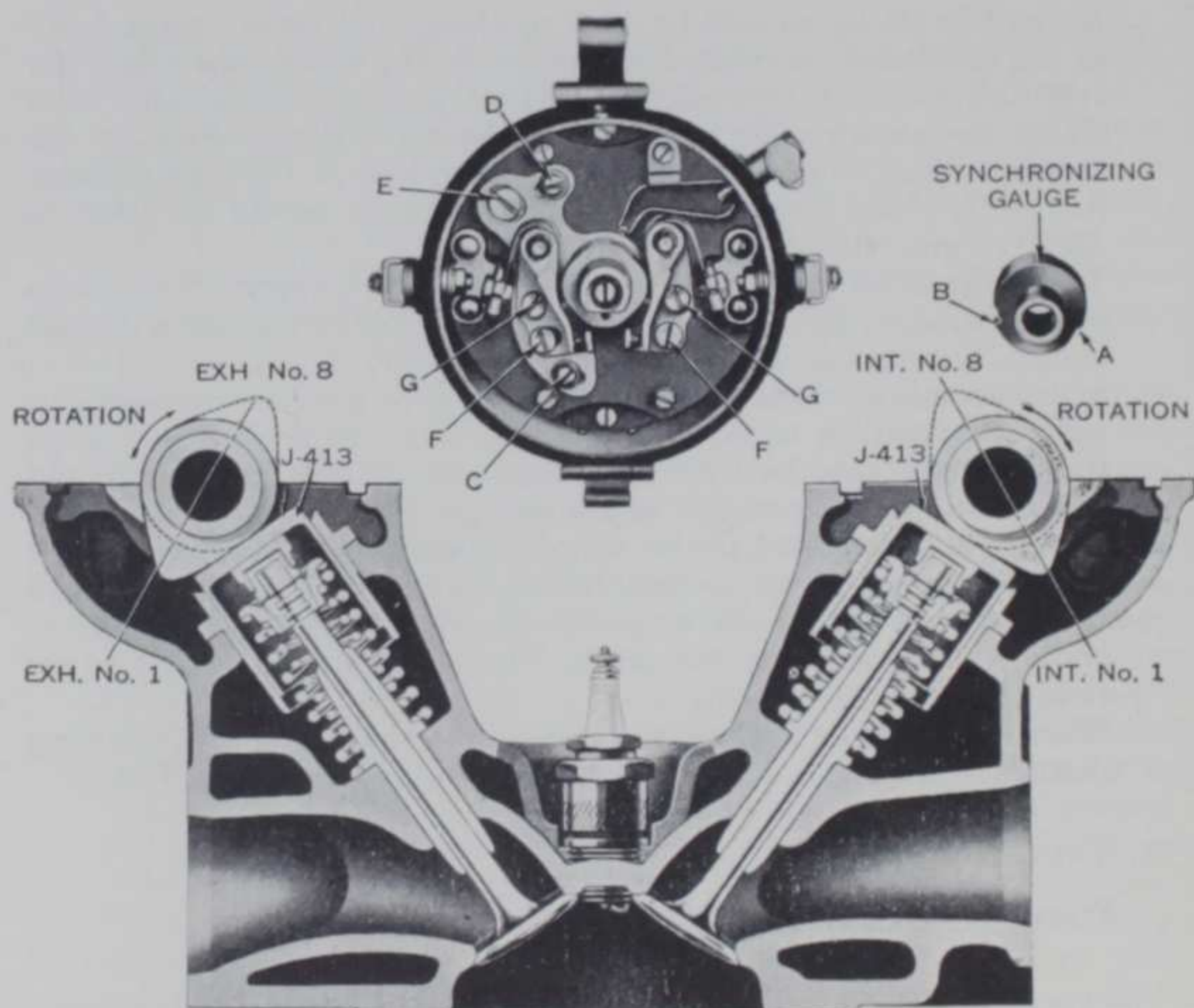


Fig. 5. Valve and Ignition Timing Diagram



do this will cause a great amount of additional work in setting valve clearances.

10. In grinding valves, seats should not be given a greater width than  $3/32''$ . In case it is necessary to grind seats, to a greater width in order to obtain a full bearing for the complete circumference a valve seat sweeping tool should be used to narrow the seats.
11. Reassemble valves, springs, keepers, tappet valves, adjusting nuts and camshafts. Be sure tappet guide clamps and all camshaft bearing caps are tight. Rotate camshafts and with feeler gauge blades obtain actual clearance between cams and tappets. Remove camshafts, tappets and tappet adjusting nuts and with shims of varying thickness change length of adjusting nut to the required dimension to give  $.023''$  to  $.025''$  clearance. One inch micrometers must necessarily be used to check length of adjusting nut before and after removing shims.
12. Assemble cylinder head and units to motor being sure to set valve and ignition timing as illustrated in Fig. 5 and described under their respective headings.

#### (58) CARBON DEPOSIT

Ordinarily it is not necessary to clean out carbon and grind valves under 15,000 to 25,000 miles, provided a clean burning high compression gas is used at all times. Oil changes must be made as recommended to eliminate crankcase dilution and carbon deposits.

Carbon can only be removed by scraping after cylinder head is removed as described under "Grinding Valves".

### FUEL SYSTEM

Gasoline is supplied to the carburetor from the 26 gallon tank at the rear by means of a mechanically operated bellows pump in conjunction with an electric booster pump. A gasoline chamois strainer bowl is placed just ahead of the pump to trap dirt and sediment which has accumulated in the gas tank. A positive supply of clean gas is thus maintained at the carburetor under all operating conditions.

#### (59) CARBURETOR

The special Schebler carburetor is a duplex air metering type supplying the two separate manifold chambers from one fuel chamber and bowl. The carburetor has two  $1\frac{1}{4}''$  throat openings with adjustments for each one similar to two carburetors and thus metering the gas mixture separately to Nos. 3, 4, 5, 6 and 1, 2, 7, 8 cylinders as is readily determined by observing the intake manifold.

#### CONTROL HOOK-UP

The control tubing is fastened securely in the clamp and screw



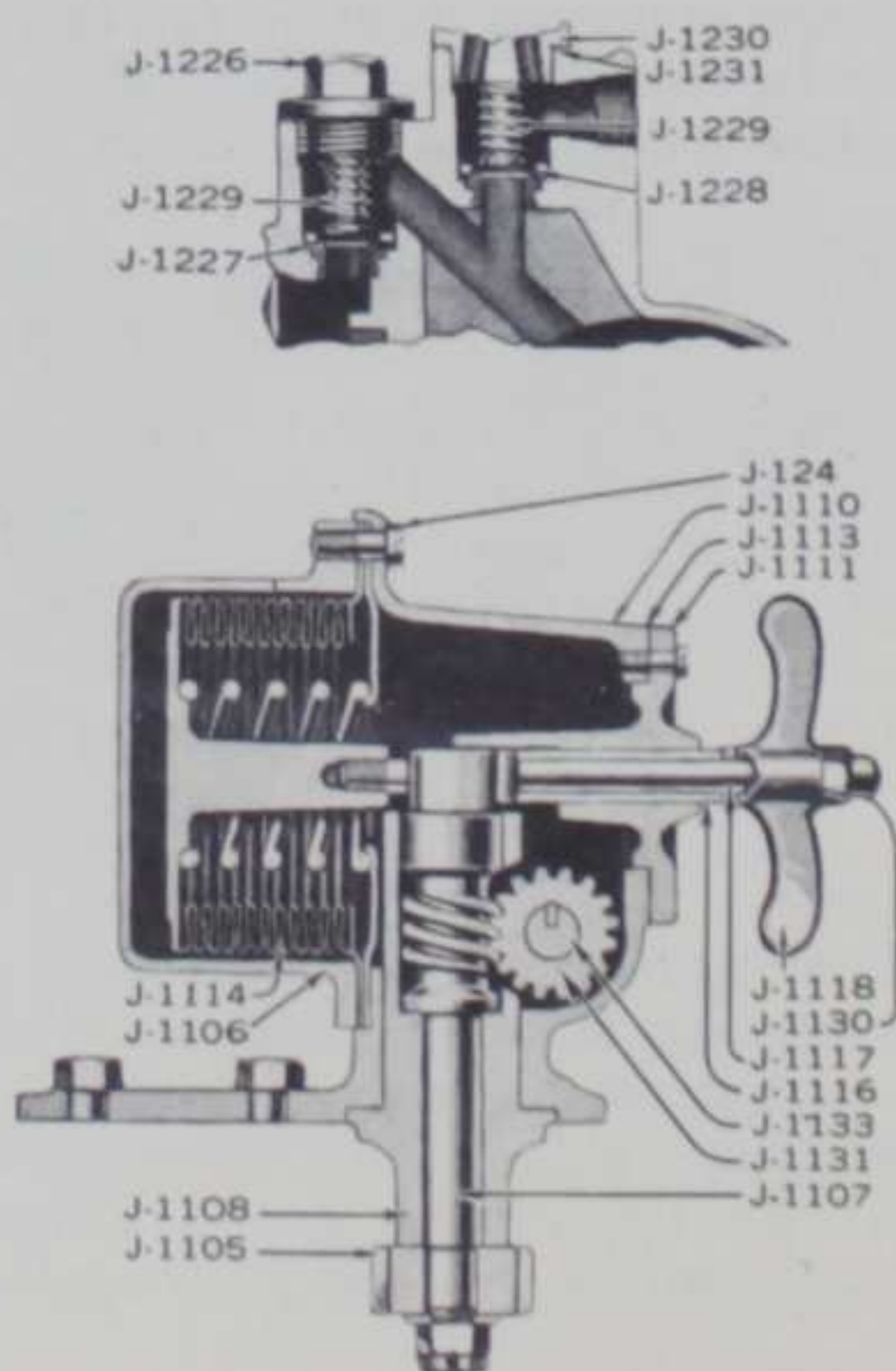
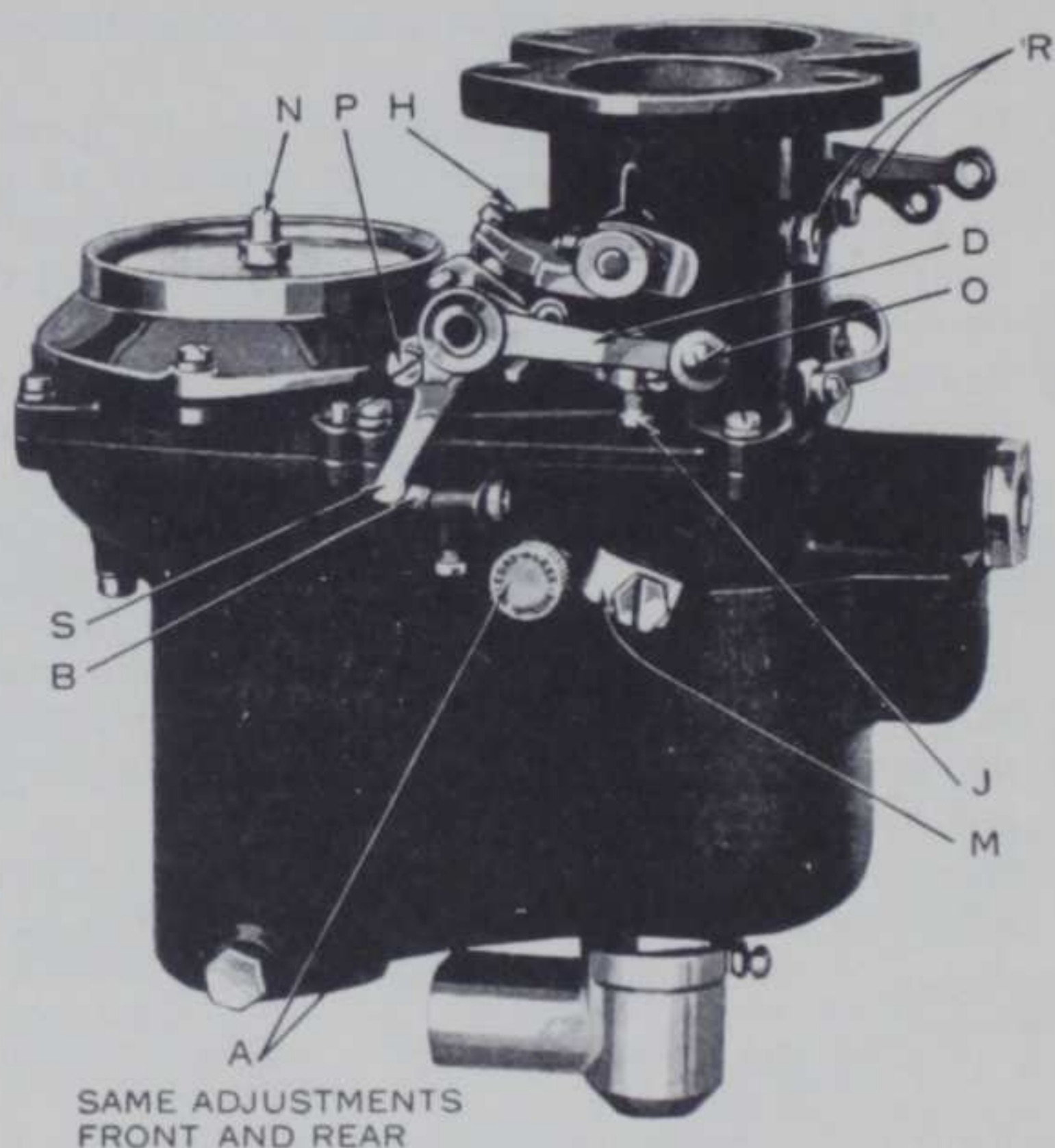


Fig. 6. Carburetor and Cross Sectional View of Fuel Pump



Fig. 6. PARTS DESCRIPTION

J- 124	Fuel pump drive housing screw	J-1117	Fuel pump shaft rod
J-1105	Fuel pump driven gear	J-1118	Fuel pump shaft handle
J-1106	Fuel pump bellows housing	J-1130	Fuel pump shaft bottom nut
J-1107	Fuel pump drive shaft	J-1131	Signal box driven gear
J-1108	Fuel pump drive shaft bearing	J-1133	Signal box drive shaft
J-1110	Fuel pump drive housing	J-1226	Fuel pump intake plug
J-1111	Fuel pump drive housing cover	J-1227	Fuel pump intake valve
J-1113	Fuel pump drive housing cover gasket	J-1228	Fuel pump outlet valve
J-1114	Fuel pump bellows assembly	J-1229	Fuel pump valve spring
J-1116	Fuel pump operating shaft	J-1230	Fuel pump pressure dome
		J-1231	Fuel pump valve plug gasket

assembly "M" with tubing projecting about 1/16" beyond the clamp and the control wire in binding post "O" so there is about 1/16" play between the loose lever "D" and screw "P." When the throttle is closed after tightening binding post "O" straighten out the control wire so that the loose lever "D" does not bind the dash control lever "S" and cause it to stick open when moved. Use this control only in starting and warming up motor as explained in Part I of this book under "Instruments and Controls". If trouble is had in starting a warm motor open the throttle half way.

**IDLING ADJUSTMENT**—There are two idle adjustments as marked "A" one on the front side and one at the rear. The motor should be thoroughly warmed up before making the idle adjustments. Both spark and throttle should be fully retarded.

Before making idle adjustments "A" in front disconnect spark plug wires to Nos. 3, 4, 5, and 6 cylinders and allow the engine to run as a four cylinder motor.

Turning "A" in front, to the right (clockwise) makes the mixture leaner for cylinders 1, 2, 7, and 8; to the left makes the mixture richer.

Disconnect spark plug wires to 1, 2, 7 and 8 cylinders before changing idle adjustment "A" in rear.

Turning "A" in rear as if it were connecting to the same shaft as "A" in front, leans or richens the mixture for cylinders No. 3, 4, 5 and 6. The motor should idle down to approximately 200 r p m on the tachometer when running as a four cylinder motor or approximately 350 r p m when running as an eight cylinder motor.

To change the idle speed, adjust the idle screw "H". After making above adjustments and engine is running as an eight cylinder motor it may be necessary to change both adjustments the same number of clicks to make the total mixture lean or rich.

**RANGE ADJUSTMENT**—This adjustment is only effective in the driving range at speeds from 20 to 70 miles per hour and does not effect acceleration or hill climbing with wide open throttle. The adjustment is made by turning the range adjusting screw "B" to the left for a lean mixture and to the right for a rich mixture. This adjustment as shipped from the factory is usually found to be best.

To obtain the original factory setting, screw the range adjusting screw "B" in or out so the head is flush with the edge bushing enclosing it. Whenever the range adjustment is changed it is necessary to readjust the idle mixture.



SECOND METHOD OF ADJUSTMENT—In case the carburetor cannot be adjusted in the above manner to give the desired results the following procedure may be used.

Set range screw "B" to original factory setting as explained in the previous paragraph.

With spark and throttle fully retarded idle the motor on each set of four cylinders and lean the respective idle adjustment on each set until motor stops, then back up or enrichen 8-14 notches until motor runs smoothly. This adjustment must be made separately for each set of four cylinders. Any variation in r p m for the two sets may be altered by turning screw "R" in to speed up, or out to slow down its group of cylinders. The total idling speed of the motor operating on eight cylinders may be set by turning screw "H".

WIDE OPEN THROTTLE ADJUSTMENT—The extreme high speed adjustment may necessarily need to be changed in some localities but this should only be done by an authorized Schebler service station. This adjustment is made at the contact cam screw "J" operating against throttle cam.

#### (60) CARBURETOR HEAT CONTROL

Exhaust heat is passed from the exhaust manifold across the cylinder block to the chamber around the intake manifold and then discharged through auxiliary pipe and muffler mounted along the left side of the frame. The amount of heat by-passed is regulated by means of a thermostatically controlled valve at the exhaust manifold. This valve automatically opens when motor temperatures are low and closes as the motor maintains the correct running temperature. The temperature at the top of the intake manifold is maintained at 125°F and 150°F to give uniform carburetion. Should the manifold receive too much heat the connecting link between the thermostat and valve at the exhaust manifold should be lengthened. A butterfly valve operated by the throttle rod further controls this heat as it leaves the intake manifold into the pipe and auxiliary muffler. This valve operates to compensate for variation of pressure in the exhaust system by closing when the pressure in the exhaust manifold is greatest and opening when pressure is low.

#### (61) FUEL PUMP

A spring loaded diaphragm or bellows, operated by means of a cam, driven from a side gear on the generator shaft constitutes the fuel pump. As the cam compresses the bellows, the inlet check valve under the large hexagon nut just at the rear of the gas filter opens and allows gas to pass into pump. Immediately as the cam action releases and allows the bellows to expand with the spring tension, the outlet valve opens under the dome expansion chamber and gas passes to the carburetor. The dome expansion chamber filled with air equalizes the pressure of the pump for the carburetor.



Should the pump fail to deliver gas to the carburetor, remove and clean, check valves under the hexagon nut at the rear of the filter and under dome expansion chamber.

The entire mechanism runs in a bath of oil eliminating any necessity for attention and adjustment. A handle at the side of the pump is attached to the diaphragm shaft and when operated by hand for a few strokes will prime the entire system. The strainer bowl should be removed and cleaned or slushed every 5,000 miles.

#### (62) ELECTRIC BOOSTER PUMP

An electric booster fuel pump is mounted in the left frame side member underneath the front seat. This pump further insures a uniform pressure in the gasoline line at all speeds and requires no attention. The ignition switch controls the operation of this unit.

#### (63) GASOLINE GAUGE

The gasoline gauge on the instrument board indicates at all times the amount of fuel in the rear tank. It is operated by the weight of gasoline pressing on a column of air which in turn causes the red liquid in the gauge head to rise or fall. Should the car be left standing for a week or longer the gauge may show less than the tank contains but driving the car for several blocks will cause the reading to be corrected.

If any difficulty is encountered with the gauge proceed as follows. Disconnect the air line at the gauge head. The liquid must come to rest exactly at zero. If necessary adjust the height of the column or add to or remove a few driops of liquid at the top of the brass tube. To remove liquid absord some on a toothpick or match.

*Caution.* Use only the special telegage liquid obtainable from the factory or the King-Seeley Corporation, Ann Arbor, Mich. Remove gas tank filler cap and blow air line dry with 50 full vigorous strokes of a hand tire pump. Do not use compressed air. Connect air line at gauge head and see that line is air tight at tank unit. The gauge will read zero until the car is driven a few blocks, whereupon the correct reading will be maintained.



## IGNITION SYSTEM

The ignition system may be classified as two distinct units with one set of breaker points and coil firing the center four cylinders (3, 4, 5, 6) and the other set of points and coil firing the two end pairs (1, 2, 7, 8). This type ignition permits low speed breaker point contacting thus giving positive firing of spark plugs under all speeds. The spark plugs are located directly over each piston and at the center of gas turbulence in the combustion chamber.

## (64) DISTRIBUTOR

The distributor is mounted in casting above center of intake camshaft and locked in position by retaining plate and four "acorn" headed studs. By removing studs and plate with spark control lever the distributor may be removed. The head and rotor are of the single jump spark type using side outlet cap. A four lobe cam and double breaker arms in parallel circuit with the coils fire the cylinders in the following order. 1-6-2-5-8-3-7-4.

## (65) SPARK ADVANCE

The distributor is a semi-automatic advance with the rotation in a clockwise direction viewing from the top. A manual advance of 20 degrees is obtained by shifting the distributor in its mounting. An automatic advance of 40 degrees is obtained through spring controlled governor weights of the marine type located beneath the breaker plate in the distributor cup and require no attention. As the speed of the motor and distributor shaft increases, when accelerating, the weights are gradually thrown outward and advance the cam in the direction of rotation.

## (66) CONTACT POINTS

The contact points should be inspected every 5,000 to 10,000 miles and set at .018"—.024" clearance when fully opened by cam. To adjust points for this dimension loosen screws "F" and turn screws "G". Fig. 5. Points should present a "frosted" appearance and if black should be cleaned with fine emery cloth on a flat tool surface. Do not attempt to synchronize points by setting with different clearances but shift points on anchor plate as described under "Ignition Timing".

## (67) IGNITION TIMING

Turn motor until intake and exhaust cams are in the same position as shown in Fig. 5, which is the firing center for No. 8 cylinder and four lobe cam should be in position as shown.

In timing the ignition it is quite necessary to set both sets of points so that they are absolutely synchronized and fire all cylinders at same time with relation to their respective center lines on the flywheel. The points may be synchronized in the following manner



by use of special synchronizing tool J-6965 as illustrated in Fig. 5. Considerable time can be saved in retiming the engine by marking position of rotor and four lobe cam before removing so that it may be put back in the same position.

Loosen the screw in center of cam mounting the second time and remove cam, but do not tighten screw as synchronizing gauge should be free to turn when placed on this shaft. Rotate the gauge until the breaker arm rubbing blocks drop into the notches on its surface. Then holding the shoulder of the one notch firmly against the side of the block at "A" loosen the screws "C" and "D" and turn eccentric "E" until the side of the other block is in contact with the shoulder of the notch at "B". With the arms in this position tighten screws "C" and "D". The adjustment can be checked by holding the gauge solidly against the rubbing blocks and lifting each breaker arm in turn. If they are properly set a slight friction will be felt as the arms are raised from the gauge. Remove synchronizing tool and place four lobe cam on mounting post and lock in position so that No. 8 cylinder will fire at  $1\frac{1}{2}$ " before top center with spark control fully advanced. No. 3 cylinder should fire just 90 degrees later on the flywheel at  $1\frac{1}{2}$ " before its top center. These firing points may be determined by turning flywheel, using prybar with ignition switch "On" and noting when ammeter drops to zero.

#### (68) DISTRIBUTOR HEAD

The distributor has one high tension lead for each coil and eight spark plug leads with terminals marked in the same manner as the wires are attached to the plugs. The firing order 1-6-2-5-8-3-7-4 is thus obtained by each end of the dual arm rotor firing the respective cylinders in this order.

#### (69) CARE OF DISTRIBUTOR

Eight to ten drops of light engine oil should be placed in side oiler every 5,000 to 10,000 miles. Also when points are adjusted a very thin film of vaseline should be placed on cam to lubricate fibre rubbing block contact. The center plunger and the brass track inside the head should always make contact with rotor at center and carbon rubbing brush. The carbon brush may be broken quite easily in case head is not removed properly.

#### (70) CONDENSERS

Two condensers are mounted inside the distributor housing beneath breaker plate assembly and connected in parallel with the respective set of points.

#### (71) SPARK PLUGS

The spark plugs used are built specially for this motor using a standard 18 mm. thread. Points should be set at .022—.028 inches.



In no case should different plugs be used and when replacement is necessary be sure to obtain plugs with the exact specifications on the porcelain as given on the original ones.

## (72) COILS

Two coils mounted on rear of instrument board are connected in parallel circuits to the respective set of coil points. A single ignition switch controls the complete circuit.

# COOLING SYSTEM

## (73) COOLING SYSTEM

Ample cooling is supplied by means of a large capacity radiator with positive circulation direct from centrifugal water pump located pump located at right front side of motor.

The capacity of the entire system is 7 gallon with a drain valve located at the bottom of the radiator on the left hand side to be used for flushing. A drain cock is also provided at the right rear side of the cylinder block to drain portion of water remaining around cylinder chambers.

A non-freezing solution of water and alcohol (only) is recommended for use during the winter months. Many other non-freeze solutions are recommended individually by their respective manufacturers as nothing has been found more satisfactory in every manner than alcohol.

A table is given below for your convenience in preparing the correct mixture proportions for desired temperatures.

Atmospheric Tem.	Alcohol	Water
10° F. above Zero	6 qts.	22 qts.
0° F. Zero	8 qts.	20 qts.
10° F. below Zero	9½ qts.	18½ qts.
20° F. below Zero	11½ qts.	16½ qts.
30° F. below Zero	13½ qts.	14½ qts.

Should alcohol be spilled on the lacquer wash immediately with water to avoid dissolution.

## (74) HOSE CONNECTIONS

The two radiator hose connections should be inspected every few months and clamps tightened to prevent any leaks occurring at these points. Hose connections should be replaced at the end of the winter months as the anti-freeze solution may deteriorate the inside and thus restrict water passages and circulation.

## (75) WATER PUMP AND FAN

The water pump located on the right front side of the cylinder block is driven by means of a safety coupling from accessory shaft



and lower chain. A stainless steel shaft with brass rotor impellor and aluminum housing forms a non-corrosive unit to provide efficient operation throughout the life of the car. A long non-gran bronze bushing and steel thrust button eliminate the necessity of adjustments or replacements and the only attention necessary is the occasional tightening of the packing nut. New packing may be installed without removing water pump.

The fan is supported on plain annular ball bearings and should be packed with alemite grease every 10,000 miles. To adjust fan belt, loosen eccentric locking bolt at top of mounting and turn top of eccentric with spanner wrench to left side of car to remove slack in belt. It is not necessary to have belt absolutely taut.

## CLUTCH

The clutch is a dual-plate, dry disc type, designed especially for ruggedness, ease and smoothness of operation.

It is composed of two major units; the cover and pressure plate assemblies, the driven member using a special dampening element for absorbing and storing the power impulses of the motor into an uninterrupted torque at all speeds.

### (76) CONSTRUCTION

The driven member or dual plate assembly consists of a hardened splined hub, two driven discs to which the friction facings are attached and the center driving plate.

Twelve coil springs are located between the splined hub flange recesses and the driving blocks that are riveted to the discs. This feature allows a determined amount of lateral movement between the discs and the hub to compensate for lapse of power between power impulses of the motor.

The cover plate assembly consists of the outer driving plate and the stamped cover plate in which are mounted the twelve pressure springs and six release levers. These springs produce a pressure against the outer and inner pressure plates and flywheel face to engage the friction faces of the lining for the drive discs. The pressure exerted by these springs is far in excess for the actual requirement to compensate for wear on the facings and thus eliminate any necessity for future adjustments to units within the assembly. The only adjustment necessary is at the clutch pedal and this should be maintained so as to produce 1" to 1½" free movement of the pedal from the floor board. The clutch release bearing being completely enclosed and lubricated automatically by the chassis lubricating system relieves any necessary attention for lubrication.

### (77) DISASSEMBLING AND ASSEMBLING

To disassemble the clutch it is first necessary to remove the transmission. In moving the transmission from its mounting be sure not to



not allow the weight of the unit to rest on the clutch shaft when partially removed from clutch assembly. Remove the six  $\frac{3}{8}$ " cap screws at the outer edge in the cover plate assembly. The complete unit may then be removed from the flywheel.

Mounted in the cover plate there are three center plate adjustment screws. When installing the assembly on the flywheel the three center driving plate and adjustment screws should be backed out until their ends are flush with the face of the pressure plate.

In placing the complete clutch on the flywheel a splined dummy shaft should be used to align the splined hub with the forward pilot bearing while the six cap screws in the cover plate are being tightened down. After the above operation the three center plate adjusting screws should be screwed forward as far as possible and then backed off four notches.

It is then only necessary to adjust the pedal position as described in previous paragraph. Should a splined dummy shaft not be available for aligning splined hub in the assembly the transmission may be placed in position and then the six cap screws tightened thru

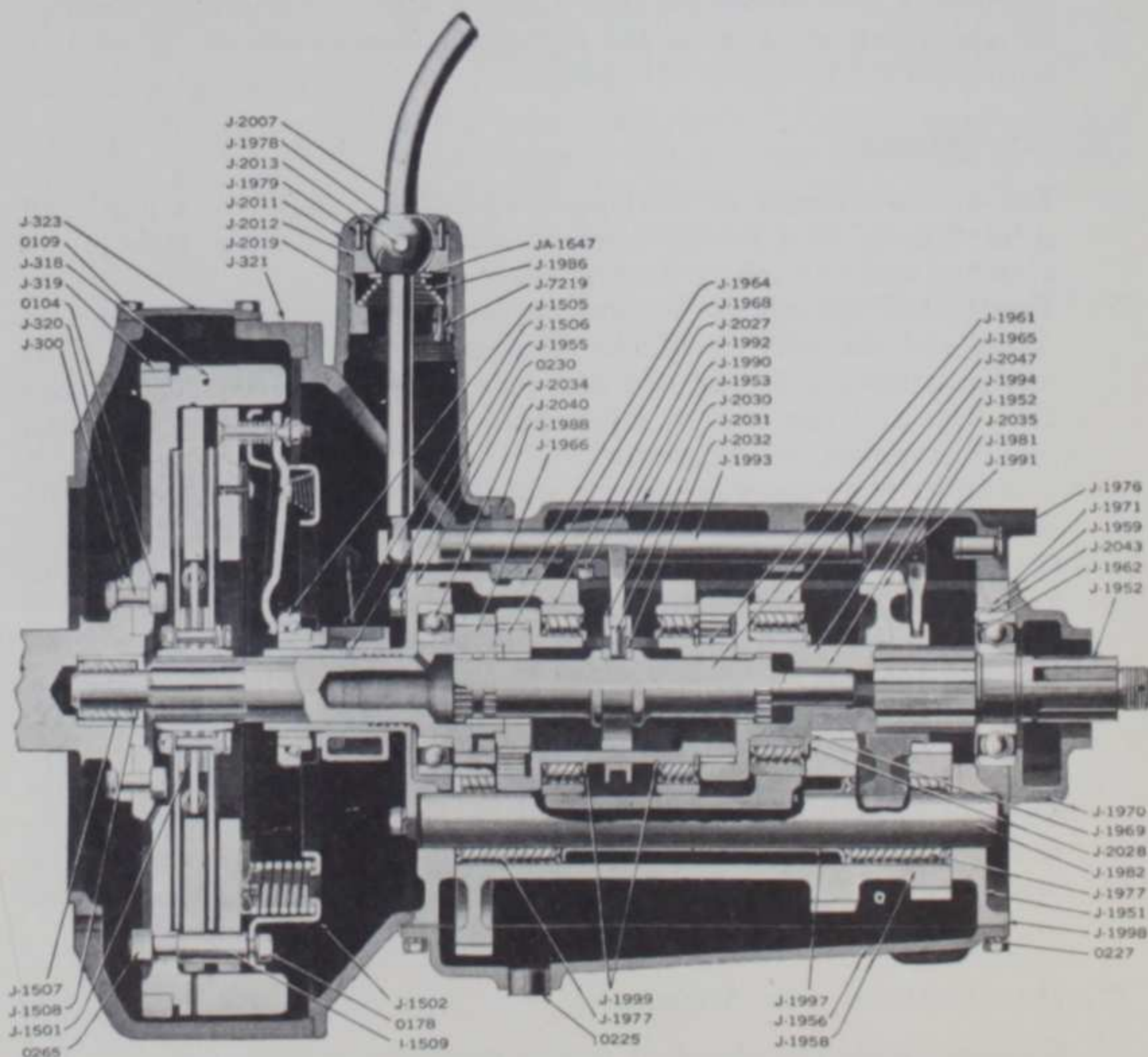


Fig. 7. Cross Sectional View of Clutch and Transmission



Fig. 7. PARTS DESCRIPTION

J- 300	Crankshaft	J-1986	Gear shift lever support
J- 318	Flywheel	J-1988	Gear shift bracket dust felt
J- 319	Flywheel ring gear	J-1990	Shifter high & intermediate fork
J- 320	Flywheel bolt	J-1991	Shifter low and reverse fork
J- 321	Flywheel housing	J-1992	Shifter fork screw
J- 323	Flywheel housing cover plate	J-1993	Shifter high and second rail
J-1501	Clutch driven member assembly	J-1994	Shifter low and reverse rail
J-1502	Clutch cover plate assembly	J-1997	Countershaft gear bearing spacer
J-1505	Clutch release bearing	J-1998	Transmission case pan.
J-1506	Clutch release sleeve	J-1999	Eccentric gear snap ring
J-1507	Clutch pilot bearing	J-2007	Transmission case pan gasket
J-1508	Clutch pilot bearing retainer	J-2011	Gear shift bracket
J-1509	Clutch driving stud	J-2012	Gear shift lever socket
JA-1647	Gear shift lever spring washer	J-2013	Gear shift lever fulcrum pin
J-1951	Transmission case	J-2019	Gear shift lever socket nut
J-1952	Main shaft	J-2027	Eccentric gear (NC-212) bearing
J-1953	Shaft frame	J-2028	Main shaft bearing washer
J-1955	Main drive gear bearing retainer	J-2030	Clutch gear shift collar
J-1956	Transmission case pan	J-2031	Clutch gear shift collar pin
J-1958	Countershaft gears	J-2032	Clutch gear shift collar ring
J-1959	Main shaft rear bearing adapter	J-2034	Main drive gear bearing retainer gasket
J-1961	Eccentric gear	J-2035	Main shaft pilot bushing
J-1962	Main shaft oil retainer rear washer	J-2040	Main drive gear bearing (No. 1211)
J-1964	Shift frame gasket	J-2043	Main shaft rear bearing (No. 1308)
J-1965	Direct and second speed clutch gear	J-2047	Main shaft front bearing (No. 211)
J-1966	Main drive gear	J-7219	Gear shift lever socket nut screw
J-1958	Second speed drive gear	0104	7/16 - 20 plain hex nut
J-1969	Main shaft snap ring	0109	5/16 - 24 - 5/8" hex head cap screw
J-1970	Main shaft rear bearing retainer	0178	3/8" - 25 - 7/8" hex head cap screw
J-1971	Main shaft rear bearing retainer gasket	0225	3/4" Briggs std. allen pipe plug
J-1976	Back up switch plunger	0227	5/16" - 18 - 3/4" hex head cap screw
J-1977	Countershaft gear bearing	0230	3/8" - 16 - 7/8" hex head cap screw
J-1978	Gear shift lever (lower end of lever) ball	0265	9/16" - 18 plain hex nut
J-1979	Gear shift lever socket pin		
J-1981	Main shaft low and reverse gear		
J-1982	Countershaft		

opening in the transmission housing with gear shift assembly and plate removed. The three screws may then be adjusted.

## (78) CLUTCH SERVICE POLICY

To save the individual dealer the expense of procuring assembly fixtures and tools for the replacement of clutch parts the following service method has been adopted:

For a nominal charge the cover plate assembly and the driven member assembly may be returned to the factory to be reconditioned. This work will be done with all worn parts replaced and the units will be the same as when new.



## TRANSMISSION

## (79) TRANSMISSION

The transmission is supplied with three speeds forward and one reverse but is a "four speed forward type" of design. An internal over-running gear gives a direct drive in both second speed and high gear allowing an absolutely quiet second gear. This design also permits an exceedingly quick shift between high and second speeds.

A conventional countershaft with quill gear drives the low and reverse sliding gear, on the main shaft at the rear of the transmission giving the low and reverse gear.

Roller bearings are used throughout the entire unit except for the main shaft bearings at the front and rear to give a positive alignment and add further to quietness.

The standard universal gear shift positions are used.

The transmission should be drained every 10,000 miles and a fresh supply of Whitmore's "O" lubricant added. Approximately 5 pints is required to bring oil to level of filler plug.

In order to disassemble transmission from car it is first necessary to remove universal joints and shaft as explained under "Universal Joints".

Remove clutch and brake pedals, shift lever and pedestal hand brake lever and controls backing light connection front muffler cover and nuts bolting transmission to flywheel housing, etc. The transmission may then be removed by pulling to the rear and lifting left side slightly to allow clutch release shaft to pass master cylinder.

*Do not allow* the weight of the transmission to hang on clutch shaft as the alignment of the complete assembly will be disturbed. If the clutch is removed be sure to use centering tool for locating driven disc in correct position as explained under "Clutch".

## (80) SPEEDOMETER GEARS

Gears at the rear of the transmission drive the speedometer. The Speedometer drive and driven gear are enclosed in the small housing at the rear of the transmission and can only be removed after universals and shaft is removed. Any change in rear axle ratio will necessitate a change in speedometer gears.

## (81) HAND BRAKE

The hand brake mounted at the rear of the transmission proves a very simple and efficient mechanism. To adjust brake shoes loosen screw in equalizer sleeve at the center of the shaft, Fig. 11, which expands and contracts the shoes. Tighten adjusting nut on end of shaft to the position where hand brake lever will lock brake when in the fifth notch on its ratchet. When lever has locked brake in this position tighten screw in equalizer sleeve.



## (82) UNIVERSAL JOINTS

Two universal joints are used, one cushion ball joint and one mechanical joint. The cushion ball joint contains eight rubber balls to cushion and insulate drive line from power plant. The mechanical joint is lubricated automatically from the propeller shaft bearing at the torque yoke. To disassemble universal joints remove the eight bolts thru flange for rear universal and the four large bolts thru front universal. Disassemble hand brake shoes from mounting and the complete shaft unit may be removed. If rubber joint is completely disassembled a clamping ring will be necessary to hold balls with drive cross and blocks to proper position for engaging in steel casing. The mechanical joint may be completely disassembled and parts replaced without special tools.

## REAR AXLE

The rear axle exemplifies simplicity and rigidity in its general construction and employs the very latest in hypoid gearing for the final drive. The gears or bearings should not require any attention or adjustment throughout the life of the car provided the unit receives adequate lubrication.

## (83) LUBRICATION

It is very essential that Whitmore's gear lubricant No. "0" be used in the rear axle as this is the only grease that is particularly suited for the hypoid gearing. This grease may be purchased at Duesenberg service stations or may be obtained direct from the Whitmore Manufacturing Co., of Cleveland, Ohio, and their representatives. The rear wheel bearings are lubricated from the supply in center of the axle and a composition washer located inside the brake drum assembly against the bearing retainer seals the lubricant at this point, thus preventing it from passing into the brake assembly. However do not fail to drain lubricant and flush ever 10,000 miles and refill with a fresh supply. The reason for this is that metal dust and sludge forming with the old oil will be extremely detrimental to all parts if allowed to remain in use.

## (84) PINION AND RING GEAR

The hypoid gear construction provides for the pinion being off center (2 inches) which permits torque drive to be exceptionally low, allowing the chassis gravity center to be low and adding to the safety in operating the car. The assembly is mounted on ball bearings throughout with a sleeve adjustment for maintaining the correct position of the ring gear.



The correct position of the pinion is maintained by shims (J-3040) the removal of which brings the pinion in deeper mesh with the ring gear. In cases where the unit is disassembled for any reason, the dimension marked on the face of the pinion, is the distance from the face of the pinion to the center of ring gear assembly and should be set for this exact dimension for trial setting of gears. This position should never be altered only in cases where it is necessary. The ring gear and differential unit may be disassembled from the axle housing by first removing the axle shafts as described in the succeeding paragraph, second, removing, differential cover and the two halves of carrier bosses secured in position by the four hex

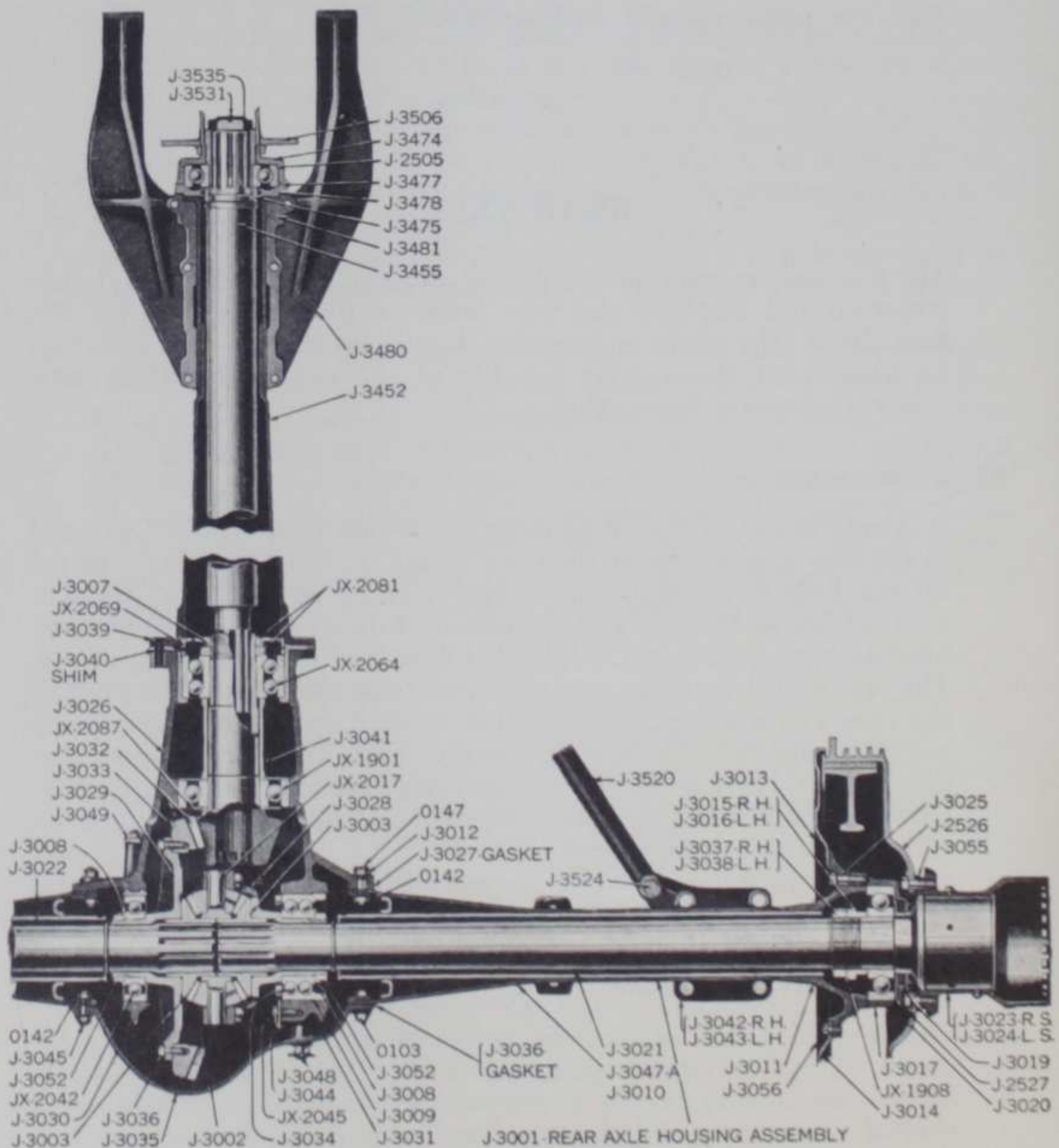


Fig. 8. Cross Sectional View Rear Axle and Torque Tube



Fig. 8. PARTS DESCRIPTION

JX-1901	Rear axle wheel pinion bearing	J-3031	Differential carrier right side cap
JX-1908	Rear axle wheel bearing nut lock washer	J-3032	Rear axle hypoid 14-53 pinion
		J-3033	Rear axle hypoid 14-53 gear
JX-2017	Differential spider arm	J-3034	Differential right side ball bearing
JX-2042	Differential L. H. bearing		Differential gear cover
JX-2045	Differential bearing lock screw	J-3035	Differential ring gear bolt
JX-2064	Drive pinion front bearing (double row)	J-3036	Rear axle wheel bearing R. H. lock nut
		J-3037	Rear axle wheel bearing L. H. lock nut
JX-2069	Pinion bearing retainer nut	J-3038	Drive pinion bearing retainer
JX-2081	Bevel pinion nut		Drive pinion bearing retainer shim
JX-2087	Bevel drive pinion washer	J-3039	Bevel drive pinion bearing spacer
J-2526	Brake drum	J-3040	Rear spring R. H. seat
J-2527	Brake drum screw		Rear spring L. H. seat
J-3001	Rear axle housing assembly	J-3041	Differential bearing retainer lock
J-3002	Differential bevel pinion	J-3042	Differential gear cover stud
J-3003	Differential side gear	J-3043	Shock absorber saddle
J-3007	Bevel pinion nut lock washer	J-3044	Differential carrier right side stud
J-3008	Differential bearing nut lock washer	J-3045	Differential carrier left side stud
J-3009	Differential carrier R. H. stud nut	J-3047-A	Differential bearing nut
		J-3048	Rear brake drum pilot
J-3010	Rear axle housing		Rear brake cover bolt
J-3011	Rear axle housing end	J-3049	Torque tube assembly
J-3012	Differential carrier stud	J-3052	Propeller shaft assembly
J-3013	Rear brake upper-half cover	J-3055	Torque yoke bearing cap
J-3014	Rear brake lower-half cover	J-3056	Torque yoke bearing spacer ring
J-3015	Rear axle wheel bearing R. H. nut	J-3452	Torque yoke bearing retainer
		J-3455	Torque yoke bearing retainer shim
J-3016	Rear axle wheel bearing L. H. nut	J-3474	Torque tube yoke
		J-3475	Torque tube yoke cap
J-3017	Rear axle wheel bearing retainer	J-3477	Universal joint rear flange
J-3019	Rear axle packing	J-3478	Radius rod assembly
J-3020	Rear axle packing retainer		Radius rod eye bolt
J-3021	Rear axle R. H. shaft	J-3480	Universal joint cotter
J-3022	Rear axle L. H. shaft	J-3481	Universal joint shaft nut
J-3023	Wire wheel R. H. rear hub	J-3506	3/8" - 24 plain hex nut
J-3024	Wire wheel L. H. rear hub	J-3' 20	3/8" - 24 jam nut
J-3025	Wheel bearing retainer bolt	J-3524	3/8" - 24 Castle nut
J-3026	Differential carrier	J-3531	
J-3027	Differential carrier gasket	J-3535	
J-3028	Differential right case	0103	
J-3029	Differential left case	0142	
J-3030	Differential carrier left side cap	0147	

nuts. The unit may then be removed. This practice of disassembling is to be discouraged however, because in reassembling it is impossible to observe the tooth contact or bearings in setting the gears. Therefore in all cases it is the best policy to completely remove the rear axle assembly from under the car when major repairs or disassembling is necessary to obtain proper tooth contact.

## (85) AXLE SHAFTS AND BEARINGS

The axle shafts are hollow and extremely large to provide a great factor of safety in carrying the load and at the same time eliminating excess weight. The shafts are supported at the outer end on large annular ball bearings which require no attention or adjustment throughout the lifetime of the car. The axle shaft, brake drum and bearing assemblies may be disassembled from the axle as a complete unit by first removing the 8-3/8" cap screws J-3025 and then tapping lightly outward against the inner edge of the drum.



## (86) TORQUE TUBE—Propellor Shaft

The torque tube encloses the propellor shaft and maintains a positive alignment for complete line of drive. The tube is anchored to the frame crossmember thru a yoke and rubber insulators allowing a cushioned drive direct to rear axle independent of springs and shackles. The propellor shaft is supported at the front by means of an annular ball bearing automatically lubricated and is connected to the pinion shaft at the rear thru a splined slip joint.

The torque tube may be disassembled after removing complete unit with rear axle or after removing universal joints. To dismantle complete unit remove spring clips lower half torque yoke insulator brackets, rear universal flange bolts, brake line flexible connection, chassis lubricator connection to propellor shaft bearing, etc. The propellor shaft can then be pulled forward out of tube after removing the front bearing retainer screws.

## FRONT AXLE

## (87) FRONT AXLE

The front axle is a chrome molybdenum forging of I beam section with reinforced flanges of ample strength to carry all radial and vertical stresses. The pivot pins are anchored in the axle forging with the steering knuckle and brake mechanism revolving about a double row radial bearing at the top and at ball thrust bearing at the bottom. An adjustment for end thrust is provided at the lower bearing by means of shims, J-2532 and adjusting nut, J-2531, Fig. 9. To make this adjustment remove locking bar J-2548 and back off adjusting nut J-2531. Remove one thin shim J-2532 and tighten nut securely. Remove sufficient shims until there is no perceptible up and down movement of steering knuckle or until a slight drag is noticed on revolving knuckle about pivot pin.

Pivot pin bearings should be packed with alemite cup grease every 10,000 miles using Zerk Gun and fitting in axle forging.

## (88) TIE ROD

The tie rod or steering cross rod has an automatic adjusting ball joint at each end. These joints should be packed with alemite cup grease every 10,000 miles and otherwise no attention or adjustment is necessary. A right hand and a left hand thread is provided at the respective ends of the rod to screw into ball joints.

The ball joints at each end of the drag link or rod from the steering drop arm to the left steering arm should be adjusted so that the rod may be twisted when gripped firmly by the hand. To obtain this adjustment, tighten ball ends as far as possible and then back off until cotter pin can be inserted.



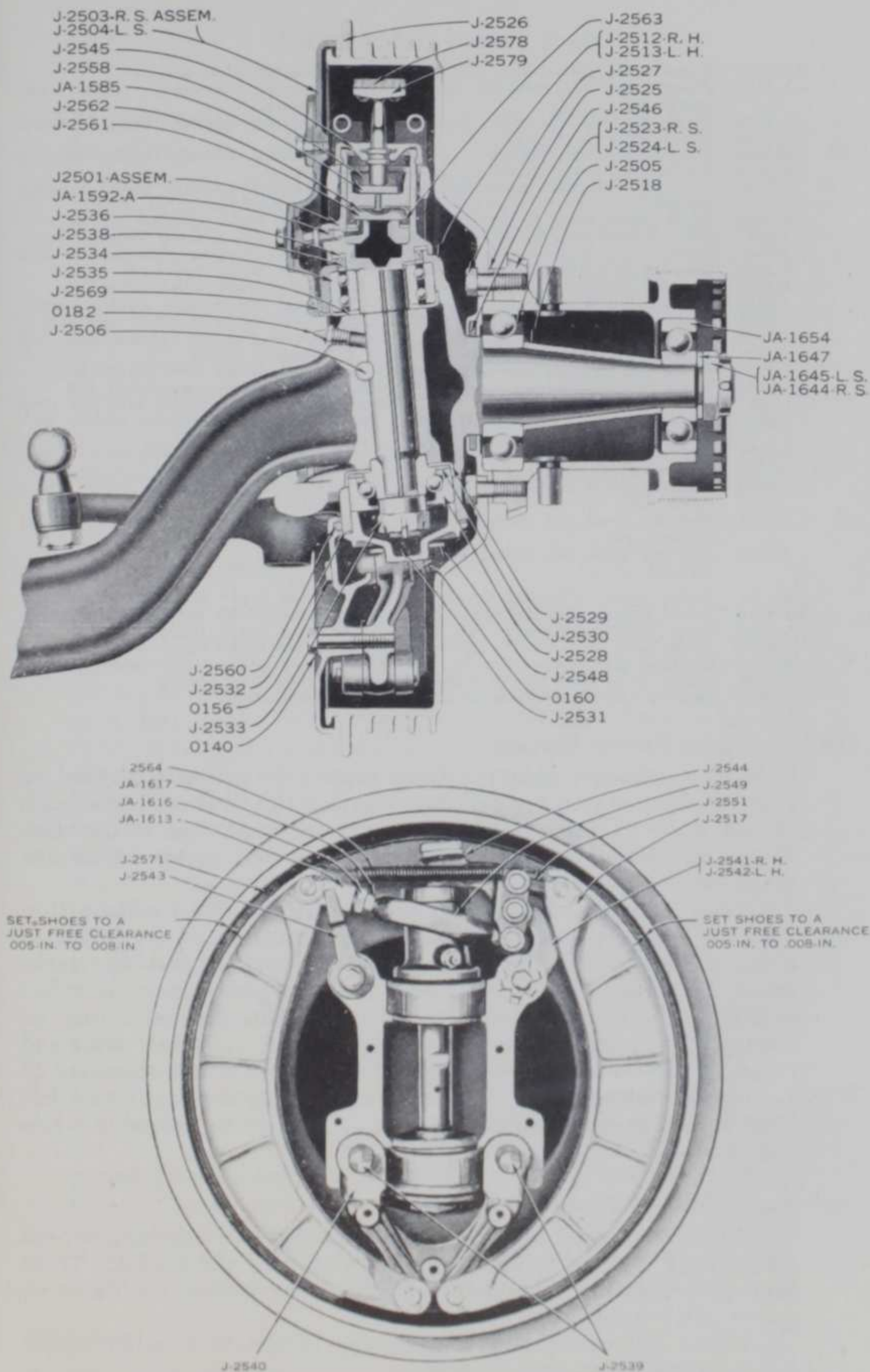


Fig. 9. Cross Sectional View of Front Axle and Wheel Brake Assembly



Fig. 9. PARTS DESCRIPTION

JA-1585	Front brake piston disc	J-2533	Steering pivot pin nut
JA-1592A	Front brake hydraulic air bleeder screw	J-2534	Steering knuckle radial ball bearing
JA-1644	Front wheel R. H. nut	J-2535	Steering knuckle radial bearing cover
JA-1645	Front wheel L. H. nut	J-2536	Steering knuckle radial bearing felt
JA-1647	Front wheel nut washer	J-2538	Steering knuckle radial bearing felt retainer
JA-1654	Front wheel outer bearing	J-2545	Front brake cylinder block
J-2501	Steering knuckles pivot pin assembly	J-2546	Front hub bearing retainer felt
J-2503	Front brake cover R. H. assembly	J-2548	Thrust bearing retainer nut lock
J-2504	Front brake cover L. H. assembly	J-2558	Front brake hydraulic piston
J-2505	Front wheel inner bearing	J-2560	Front brake lower cover felt
J-2506	Steering knuckle pivot pin lock	J-2561	Brake piston cup washer insert
J-2512	Steering R. H. knuckle	J-2562	Brake cylinder piston seal cup
J-2513	Steering L. H. knuckle	J-2563	Brake cylinder piston seal cup spreader spring
J-2518	Front wheel hub bearing spacer	J-2569	Front brake cover upper felt
J-2523	Front wire wheel R. H. hub	J-2578	Front brake toggle arm pad
J-2524	Front wire wheel L. H. hub	J-2579	Front brake toggle arm pad rivet
J-2525	Front hub bearing retainer	0140	Hex head cap screw 5/16" - 24 - 1-1/2"
J-2526	Front brake drum	0156	Hex head cap screw 5/16" - 24 - 1-1/4"
J-2527	Front brake drum screw	0160	Hex head cap screw 5/16" - 24 - 1/2"
J-2528	Steering pivot pin thrust ball bearing	0182	Zerk lubricator fitting (straight) 1/8" pipe thread
J-2529	Steering pivot pin thrust ball bearing cover		
J-2530	Steering pivot pin thrust bearing cover felt		
J-2531	Steering pivot pin thrust bearing retainer nut		
J-2532	Steering pivot pin thrust bearing retainer shim		
JA-1613	Brake toggle adjusting block	J-2542	Front brake toggle L. H. support
JA-1616	Brake toggle adjusting nut	J-2543	Front brake adjusting link guide
JA-1617	Brake toggle adjusting lock nut	J-2544	Front brake toggle arm
J-2517	Brake shoe	J-2549	Front brake toggle adjusting link
J-2539	Steering arm rod	J-2551	Front brake toggle link
J-2540	Front brake shoe (lower support	J-2564	Brake shoe spring
J-2541	Front brake toggle R. H. support	J-2571	Brake lining

## (89) ALIGNING FRONT WHEELS

It is very necessary that the front wheels be properly aligned to give satisfactory steering and long wearing life to tires. The wheels should stand  $\frac{1}{8}$ " to  $\frac{1}{4}$ " closer together in front than in the rear. This dimension should be taken at one to two inches below the center of the wheel.

To check "Toe in" do not jack up front of car. First make a thin mark or line at the center of each tire in front and set device or gauge to this dimension. Roll the car backwards until the marks are at the correct height in the rear and with gauge note the difference from the original dimension in front. This dimension may be changed by loosening the two clamp bolts at each ball joint and twisting the tie rod in the proper direction. It is not necessary to disassemble tie rod for changing "toe in" as the right and left hand thread at each end changes the length of the assembly when rod is turned.

## (90) FRONT WHEEL BEARINGS

The front wheels are carried on two annular ball bearings, which are given a tapping fit into the hub and onto the spindle. These bearings require no adjustment but should be packed with alemite grease every 5,000 miles.

To remove hub assembly it is necessary to obtain a puller which can be supplied on special order.



## BRAKES

The hydraulic breaking system embodies all the latest development in hydraulics, giving the utmost in efficiency and simplicity of construction. The system consists of four completely sealed, internal expanding brakes operated directly from hydraulic pressure developed at the master cylinder assembly upon depressing foot pedal. The brake pedal, when depressed, moves the piston within the master cylinder, thus displacing the brake fluid out thru the lead lines to the four wheel cylinders. The brake fluid enters into each of the wheel cylinders causing the piston to move upward, thus operating a reducing lever to expand the shoes against the brake drums. As pressure on the pedal is increased greater pressure is developed in the system and consequently greater braking effect is obtained. Equal and undiminished hydraulic pressure is transmitted to each brake assembly and therefore inherent equalization of braking is obtained at all times.

### (91) MASTER CYLINDER

The master cylinder is contained within the supply tank, being operated thru a connecting linkage attached to the brake pedal. The supply tank carries the reserve supply of fluid and protects the master cylinder submerged in the fluid from taking in air, dirt or water. In the head of the master cylinder, held in place by a return spring, is a combination inlet and outlet check valve. When the foot pedal is depressed and the master cylinder is pushed outward, the fluid opens the outlet check valve as it is being forced into the system. When the foot pedal is released, the master piston return spring forces the piston to its "off" position against its stop. At the same time the wheel cylinder pistons are being returned by the brake shoe return springs forcing the fluid back thru the inlet check valve until the fluid pressure balances the weight of the master piston return spring at which point the inlet valve closes. As the master cylinder returns to the "off" position, liquid is allowed to enter or be expelled, thus maintaining a constant volume of fluid in the system at all times, compensating for expansion or contraction and replenishing any loss resulting from leaks. It is imperative that the master piston be in its "off" position or fully returned when the brake pedal is resting against the toe board, else this compensating feature will be lost and the proper pressure and braking will not be maintained. To check for this setting remove the clevis pins at pedal linkage and note that the piston is fully returned. To change the position of the piston with relation to the foot pedal it will be necessary to shift bell crank J-4803 on its shaft in the desired direction of rotation.

### (92) BRAKE SUPPLY TANK

The supply tank described under the heading of "Master cylinder" is a simple reservoir and carries the surplus supply of brake fluid.



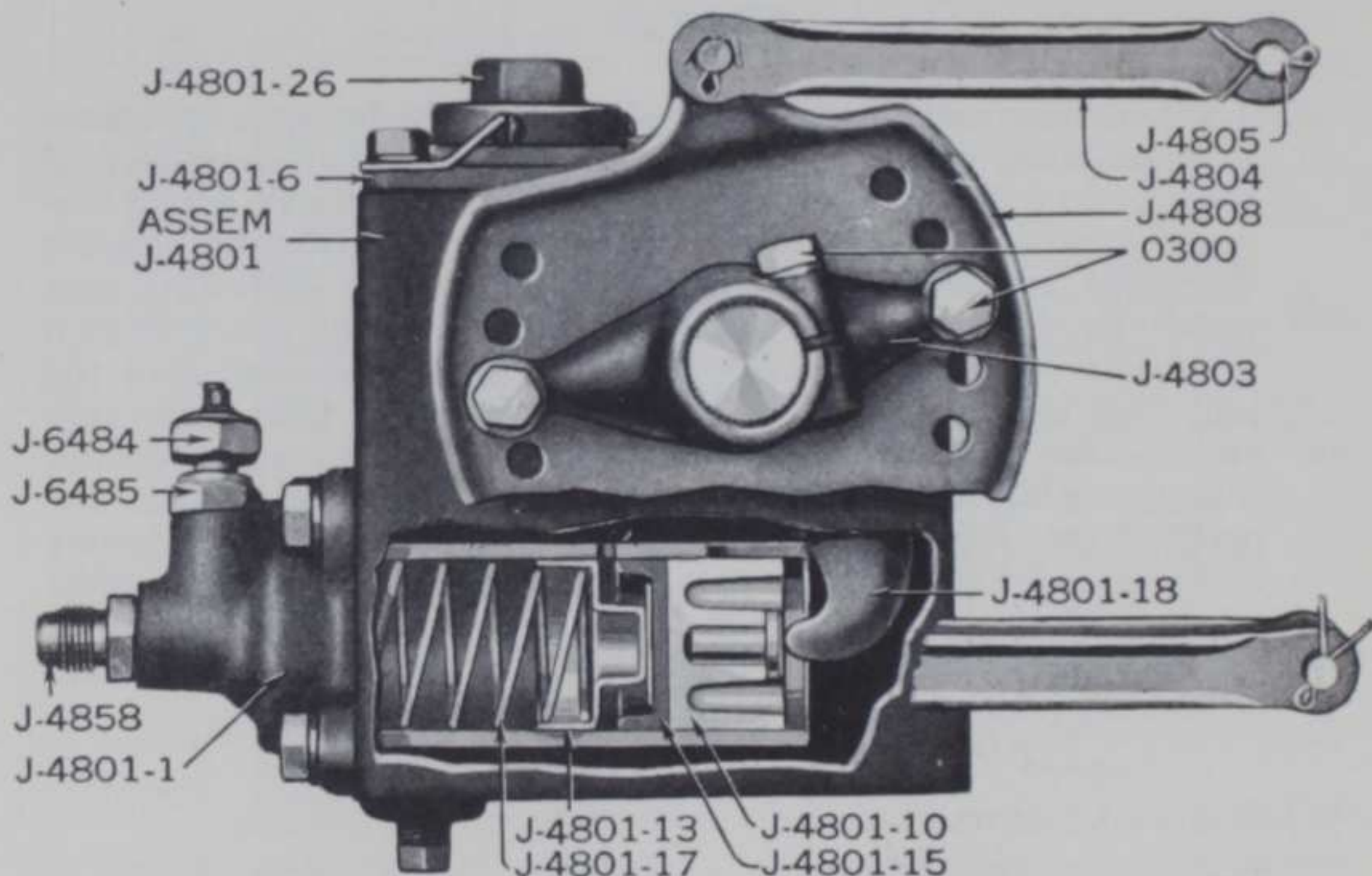


Fig. 10. Master Cylinder Assembly

0300	Master cylinder lever cap screw	J-4801-26	Master cylinder filler plug assembly
J-4801	Master cylinder assembly		
J-4801-1	Master cylinder supply tank	J-4803	Master cylinder lever
J-4801-6	Master cylinder supply tank cover	J-4804	Master cylinder lever link
J-4801-10	Master cylinder piston assembly	J-4805	Master cylinder lever link pin
J-4801-13	Master cylinder piston return spring retainer	J-4808	Master cylinder lever adjusting Plate
J-4801-15	Master cylinder piston cup	J-4858	Master cylinder to brake line union connection
J-4801-17	Master cylinder piston return spring	J-6484	Master cylinder light switch
J-4801-18	Master cylinder brake shaft lever	J-6485	Master cylinder light switch adapter

The filler plug (J-4801-26) in the tank is fitted with a breather valve sealing the tank and thus preventing evaporation of fluid and dirt entering. The supply of fluid should be maintained to within  $\frac{1}{2}$ " of the top of the tank. Use only "Lockheed" brake fluid.

### (93) WHEEL BRAKE ASSEMBLIES

The four wheel brake assemblies are identical in construction. Adjustment is only necessary to compensate for wear of the lining and the frequency of this operation depends entirely upon the service they are subjected to. Any unequal braking that may occur will undoubtedly be due to some foreign substance such as paint, grease, oil coming in contact with the lining. This condition may be remedied by thoroughly cleaning the lining with gasoline and roughening the surface with a file. In event the lining becomes thoroughly saturated with oil or grease it will be necessary to reline the shoes.



## (94) ADJUSTMENTS

Adjustments of the brakes will not be necessary until such time when the foot pedal goes to the floor board and satisfactory application of the brakes is not obtained. The necessary adjustments can readily be made by moving or expanding the shoes as outlined below.

1. Jack up each individual wheel preferably all at the same time.
2. Remove plates at front assemblies on inside dust cover marked "adjust brake here." Disassemble upper section of rear inside dust cover by removing two (5/16") caps screw and two (5/16") nuts for each section.
3. The adjusting nut (JA-1616) and locking nut (JA-1617) Fig. 9 are identical for all assemblies and provide the only and complete adjustment for the correct position of the shoes. The lock nut contains a left hand thread while the adjusting nut contains both a right and left hand thread for elongating and shortening the link connecting the shoes.
4. Loosen lock nut and turn adjusting nut in the opposite direction, expanding the shoe until the brake drags slightly against the drum (noted by rotating the wheel by hand.) Let the adjustment remain at this point for the time being. Perform this same operation for the 4 assemblies and when a slight drag has been produced on all of them, depress the foot pedal to the floor board. Depressing the pedal and applying pressure to the system allows the two shoes of each assembly to centralize or equalize their position as a unit. Upon rotation of the wheels it will be found that the brakes are again free.
5. Repeat the above operation of adjusting the shoes out against the drum and depressing the foot pedal until the brakes do not free up after depressing foot pedal. When the above adjustment is performed the last time and there remains a slight drag on each wheel, it will be necessary to back off or reverse the adjusting nut (JA-1616) 3 hexagons or one half turn and again depress the foot pedal. The brakes will then be free and all shoes will have the same correct clearance at the drums. The brakes will then be restored to their original setting and effectiveness.

## (95) RELINING SHOES

To remove shoes and reline it is necessary to first remove all brake drums. The rear ones are removed as a unit with the axle shaft as described under "Rear Axle Shafts and Bearings". To remove front drums, first remove, spindle lock nut and then tap lightly against inner edge of drum with lead or brass hammer until as-



sembly may be dismantled from spindle. Remove inside dust covers. Remove toggle pins anchoring each shoe at the upper and lower ends. The shoes may then be removed.

#### (96) WHEEL CYLINDER AND PISTON

To remove pistons at wheel cylinder it is first necessary to remove brake drums as described above. Then by lifting toggle arm (J-2544) up and to the rear, using a lever of sufficient strength the brake assembly will be shifted slightly to the rear and the piston may then be lifted out of the cylinder.

The piston may be removed more easily if the bleeder screw is opened. Use only alcohol to clean piston and cup washer.

#### (97) BLEEDING SYSTEM

When any of the pressure units or connections are disassembled or disconnected for any reason it will be necessary to "bleed" the system in order to expel the air. Before attempting to "bleed" the system fill the supply tank with genuine Lockheed Brake Fluid and keep the tank at least half full all the time. Unscrew bleeder screw (JA-1592A)  $\frac{1}{2}$  turn at one wheel; on front assemblies it will be necessary to remove plate marked "bleed here" and attach rubber hose to protruding shank of screw allowing tube to hang into container such as bottle. Depress foot pedal slowly by hand and return to normal position. Approximately ten complete strokes of pedal will be necessary to bleed each cylinder. Depressing the pedal forces fluid through lines and out at wheel cylinders expelling any air which may be in the system. When no air bubbles are heard or appear at the end of the hose tighten bleeder screw. A bleeder screw in brake line connection at front of dash and should be bled last to expel air trapped at this point. Fluid withdrawn in bleeding operation may be used again in the supply tank provided no dirt is allowed to enter the liquid.



## STEERING GEAR

## (98) STEERING GEAR

The steering gear is of a special design cam-lever type with constant pitch cam. This design gives what is known as an irreversible steering, preventing road shock being transmitted to the hand wheel and at the same time permitting very easy steering due to the small number of friction surfaces.

Lubrication is the most important factor in maintaining a steering gear at its highest efficiency. It prevents wear and rattle. Remove pipe plug and fill housing completely with *Whitmore's "65" Gear Lubricant* every 5,000 miles.

Only two adjustments are necessary to eliminate all lash in the system. All adjustments should be made with the front wheels jacked up and with the steering drop arm removed. With the front wheels set straight ahead, turn the steering wheel hand to mid-position. This is the position at which the steering drop arm should be assembled and locked securely on the trunion shaft after proper adjustments have been made.

To eliminate up and down movement of the steering wheel or end play in the column, remove locking stud with washer and back off large hexagon nut at the top of the steering gear housing. Remove one of thin shims between large nut and housing and tighten nut securely. Shims of the desired thickness should be removed until a slight drag is produced on moving the steering wheel.

To eliminate lash of lever arm in cam, adjust trunion shaft stop screw located in side gear cover plate at back of housing. Loosen hexagon lock nut and turn screw to right or clockwise until a slight drag is produced on moving the steering wheel. Tighten locking nut securely. Be sure to anchor steering drop arm with trunion arm in midposition of cam as explained above.

The steering column or wheel position may be shifted up or down after loosening the four bolts anchoring steering gear housing to frame and toe board bracket screws. Loosen screws on gate clamp at instrument board bracket and raise or lower wheel to the desired position.



## CHASSIS

The chassis unit being built exceptionally low and sturdy permits a driving ease and feeling of safety even at excessive high speeds. The absolute insulation of the power plant and torque drive from the frame by means of rubberized supports eliminates any foreign noises from these units being transmitted to the frame and allows the units to maintain a true alignment with relation to one another. The line of drive is virtually in the same plane as the power plant unit, the angle of deflection being so slight as to eliminate angular stress on the universal joints. The unique design and uniform distribution of weight, produce an equilibrium throughout the chassis giving approximately the same load at each wheel.

## (99) FRAME

The frame being of  $7/32''$  stock,  $8\frac{1}{2}''$  depth, crossed braced by four tubular, and two square shelled cross members gives a rigidity which absolutely prevents even the slightest frame flexure. The cross member at the front of the motor is braced longitudinally from each side of the motor to frame just above the front spring rear shackle. This one feature alone increases the rigidity to an equivalent of a frame twice the thickness as used. The four shell cross members riveted and gusseted at the center section of the frame insures rigidity in a like manner.

## (100) CHASSIS LUBRICATING SYSTEM

All points of the chassis requiring regular and systematic lubrication, are automatically lubricated by a special pressure pump at the motor, supplying pressure through the oil supply tank at the dash to shackles, universal joints, propellor shaft bearing, steering drag link, shock absorber arms, etc. The pressure pump at the motor is a unit of the signal box assembly mounted just ahead of the fuel pump.

The pressure pump normally operates once every 60 to 80 miles, to supply oil under pressure to the chassis bearings. The correct supply of oil to each bearing or unit is controlled thru metering valves located at these points. It is quite necessary that the oil supply be maintained in the reservoir located on the front of the dash, else air and water, causing corrosion at the various units may impair the entire system, or lack of oil may damage pump. The two signal lights at the extreme left of the instrument board indicate the operating of the system explained under "Instrument Controls".

Should the lights burn continuously or not at all the electrical contacts may be at fault.

Other units of the chassis to be lubricated less frequently and not lubricated automatically are listed under "Operation of Cars".



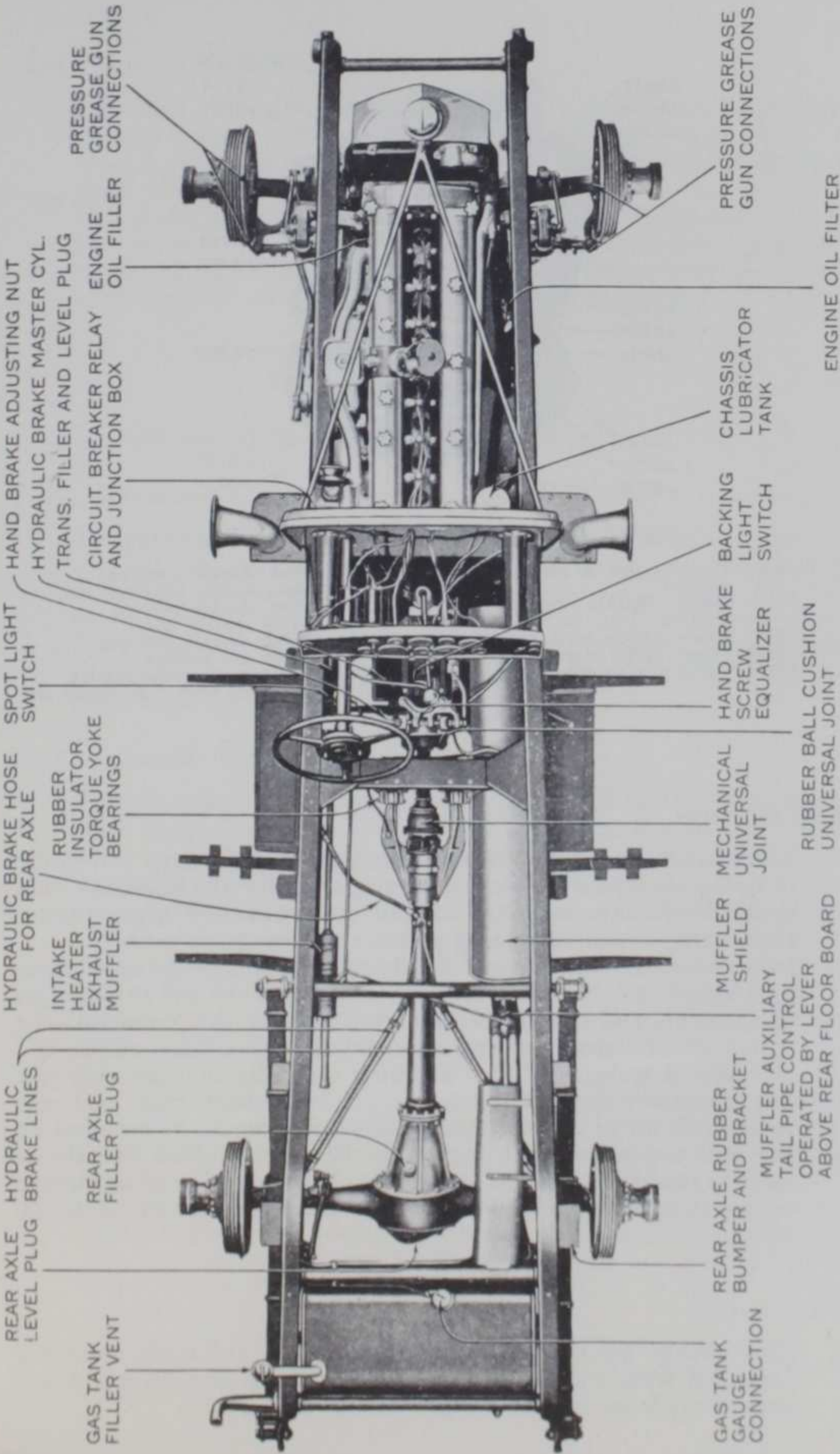


Fig. 11. Plan View of Chassis Assembly



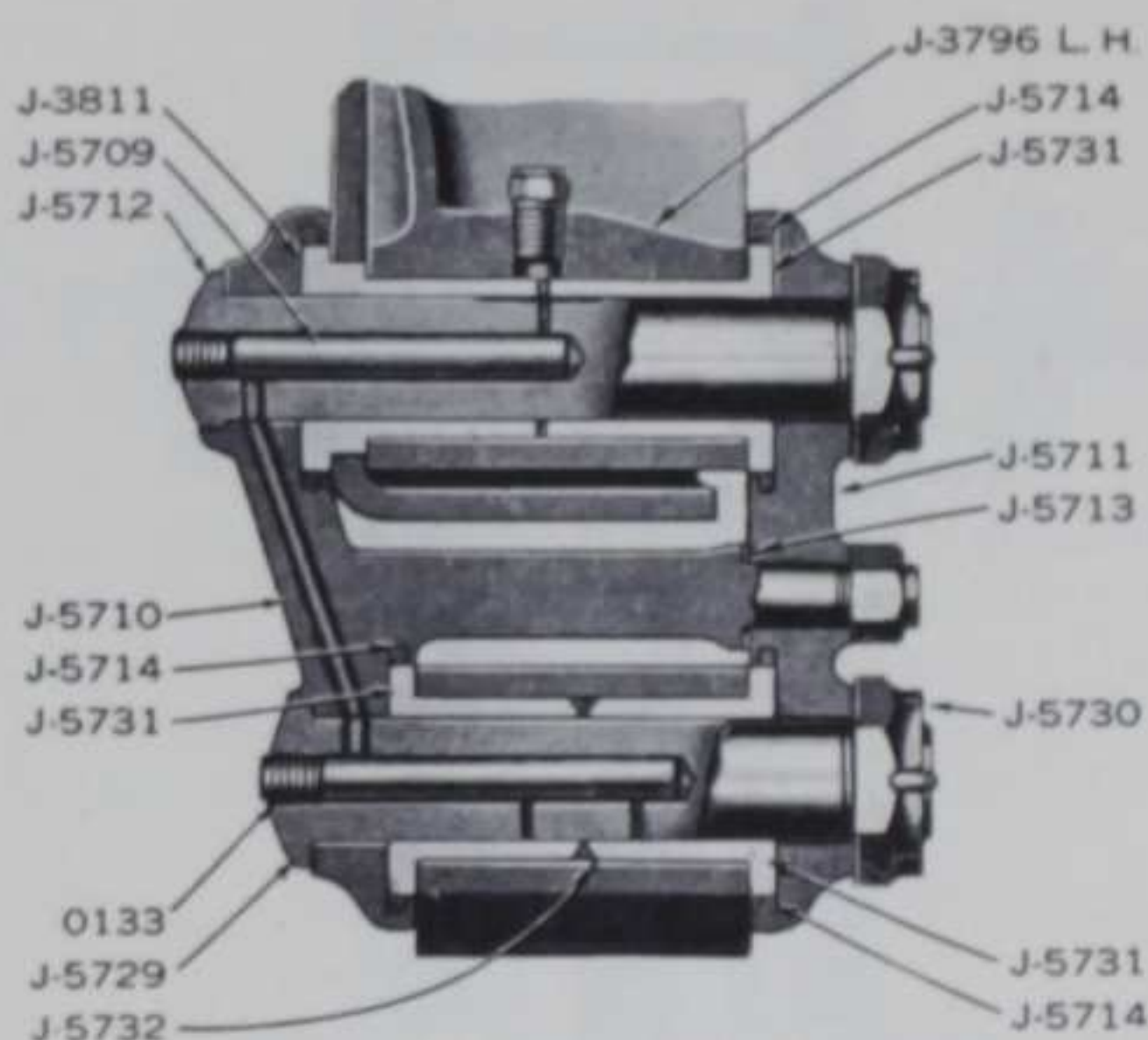


Fig. 12. Front Spring Rear Shackle Assembly

J-3796	Front engine & spring rear L. H. support	J-5712	Offset shackle pivot pin
J-3811	Offset shackle front pin outer Bushing	J-5713	Offset shackle adjusting shim
J-5709	Offset shackle pivot pin filler plug	J-5714	Offset shackle packing
J-5710	Offset spring shackle	J-5729	Spring shackle bolt
J-5711	Offset shackle side arm	J-5730	Spring shackle bolt nut
		J-5731	Spring eye bushing
		J-5732	Spring eye bushing packing
		0133	Pipe plug allen 1/8" briggs std.

### (101) SHACKLES

The shackles are of conventional design, using the very best grade of non-gran bronze obtainable as a bearing for the hardened steel shackle bolts. The bushings and bolts are extremely large, thereby eliminating excessive bearing pressure and resultant wear.

Incorporated in the design of the shackle is a special feature, whereby a supply of oil is maintained even against the end thrust faces of the bolts and bushing, eliminating wear at this point and the frequency of tightening and adjusting shackles. The correct end clearance is maintained by tightening the bolts and nuts to a just free clearance, and for the rear shackles of both front and rear springs, shims of a corresponding thickness should be removed on the bolt connecting each leg of the shackle to allow end thrust faces to remain parallel to each other. This operation of tightening or adjusting shackles will only be necessary every 10,000 to 20,000 miles.

### (102) SPRINGS

The springs are semi-elliptic in design and are made unusually long and wide with thin leaves to give the greatest strength and desired resilience for the weight of the car.



## (103) SHOCK ABSORBERS

The shock absorbers, control or check the spring action for extreme movement both in the upward and downward directions.

Thus it will be found that under all road conditions exceptionally good riding qualities will be maintained.

The shock absorbers require no adjustment throughout the life time of the car. It will of course be necessary to maintain the proper supply of liquid in each unit, using only Delco-Remy shock absorber liquid obtainable at any of their branches.

## ELECTRICAL SYSTEM

The ignition system is described under paragraph 64.

## (104) GENERATOR

The generator is driven at crankshaft speed from accessory shaft on the left side of motor, thru short shaft using two flexible disc couplings. The armature rotates clockwise on two annular ball bearings which should receive 10 drops of light engine oil every 750 miles at the same time oil is changed in the motor. The generator is a two pole shunt unit using third brush regulation with cut out relay mounted directly on housing.

## (105) CHARGING RATE

The charging rate is determined by means of the position of the third brush. To change the position of the brush loosen the round head locking screw located at one side of the bearing cover on the commutator end frame. Remove the cover band and shift the third brush in the direction of armature rotation to increase the output and in the opposite direction to decrease the output. When the adjustment is completed tighten the round head screw securely to prevent brush changing position. The charging rate should not be higher than 12 amperes when generator is hot and lesser charging rates are recommended when lights and starting motor are not used excessively.

The third brush control is supplemented by a thermostat which is an automatic switch operated by the heat inside the generator. When the battery is fully charged or the internal temperature of the generator reaches 165 degrees F. the contact points open and a resistance is placed in series with the generator field with the result that the generator output is reduced approximately 40 per cent. This type of control permits a higher charging rate on short drives longer period in the winter time which helps to restore the battery charge.

The brushes should be examined occasionally to see that they are not worn excessively and if necessary clean armature with No. 00 sandpaper.



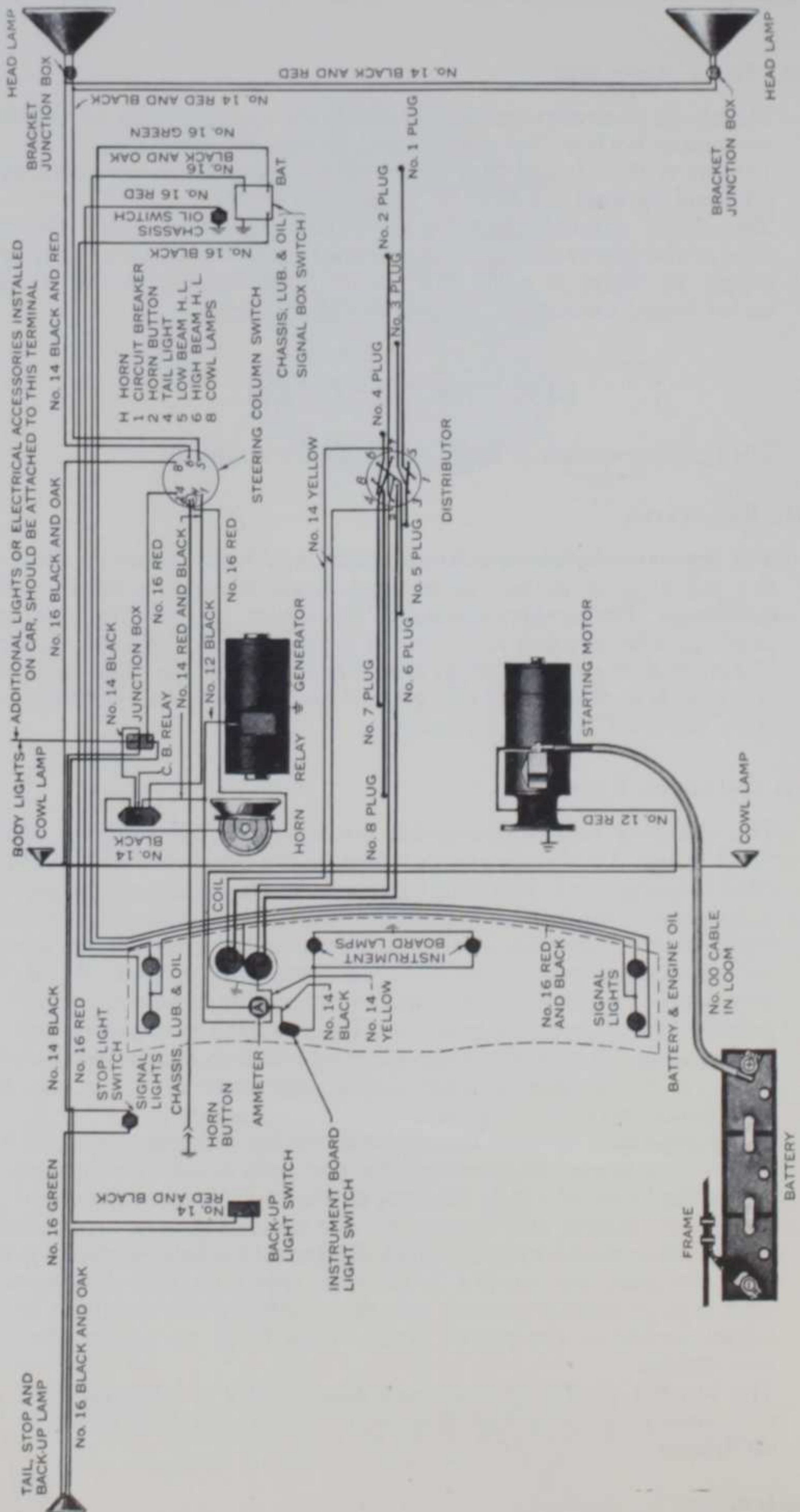


Fig. 13. Wiring Diagram



## (106) CUT-OUT RELAY

The cut-out relay mounted on the generator frame serves to automatically connect the generator to the battery circuit when the voltage of the generator is equal to the voltage of the battery and to disconnect the circuit when the generator stops or the voltage drops.

## (107) STARTING MOTOR

The starting motor is a six volt, six brush, six pole series wound unit equipped with a bendix drive to engage ring gear on flywheel. The bendix drive automatically engages when starter control is pulled out at dash. The armature is carried in graphite bronze bushings which do not require lubrication. Do not lubricate spiral shaft of bendix drive as it is only necessary that it be thoroughly clean. The cover band should be removed occasionally to inspect brushes to see that they are not worn and commutator cleaned with No. 00 sandpaper.

## (108) CIRCUIT BREAKER

The circuit breaker mounted in front of dash on left hand side is a protective device to disconnect any circuit where there is an abnormal discharge or a short circuit. This unit serves the purpose of fuses and gives a buzzing signal to warn operator of the condition of system.

## (109) LIGHTING SWITCH

The lighting switch is located at the bottom of the steering column and is controlled by the third lever at the steering quadrant. No attention should be necessary other than to keep the connections tight.

## (110) AMMETER

The ammeter on the instrument panel indicates charging and discharging rates of the battery or the correct operating condition of the entire system.

## (111) HORN

The horn is a six volt motor driven type and should receive a few drops of light engine oil periodically.

## (112) STORAGE BATTERY

The 6 volt 160 ampere hour storage battery is carried in the compartment of the splash shield on the right side of the frame. The negative terminal is grounded as the entire system is of the single wire grounded type. The battery terminals should be cleaned periodically.



and given a thin coat of vaseline. Water should be added to the battery to keep liquid  $\frac{1}{2}$ " above top of plates. The right hand upper signal light on the instrument board reminds you to inspect battery liquid every 1,500 miles.

### (113) LIGHTS

Standard light equipment is:

Headlight—High Beam 32CP, 6-8 Volts, S. C. base

Headlight—Low Beam 21CP, 6-8 Volts, S. C. base

Cowl Lights 3CP, 6-8 Volts, S. C. base

Instrument Light 3CP, 6-8 Volts, S. C. base

Tail Light 3CP, 6-8 Volts, S. C. base

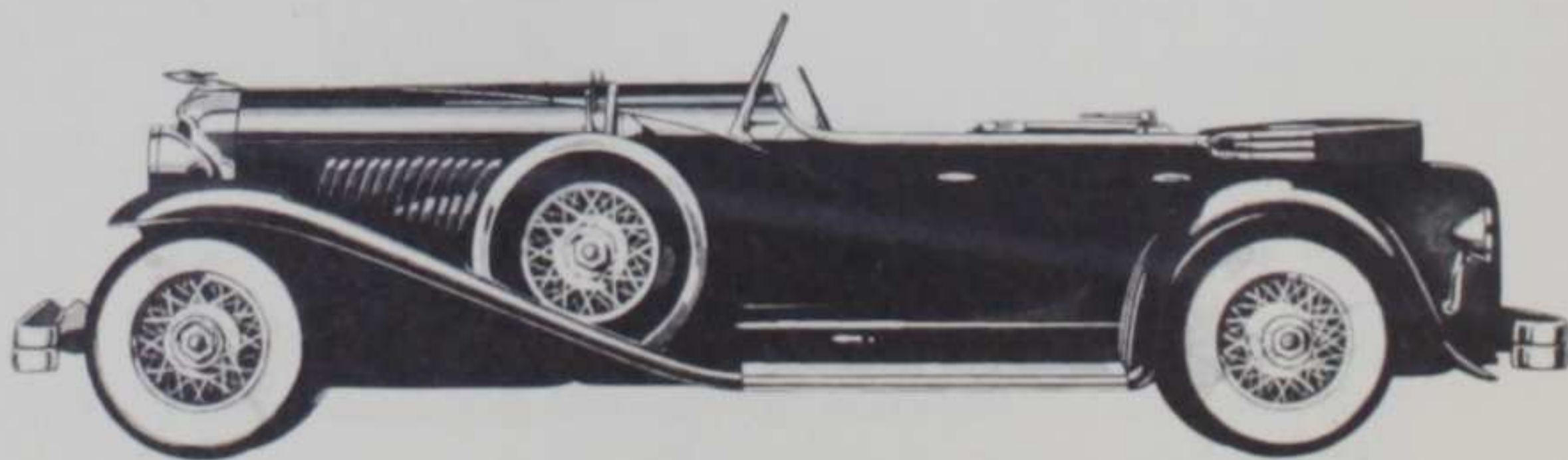
Backing and Stop Light 21CP, 6-8 Volts, S. C. base

All connections should be inspected periodically to prevent open circuits and burning out bulbs.

## BODY

### (114) BODY

Since practically all bodies supplied on the present chassis are custom built, it is impossible to include maintenance instructions and replacement details for all makes and types. However information may be obtained upon application from this factory or the respective body builders supplying the equipment. In all correspondence be sure to state, body manufacturer, body style and type seating capacity serial numbers and as many details as are available. In all cases give car number with above information.



THE DUESENBERG PHAETON



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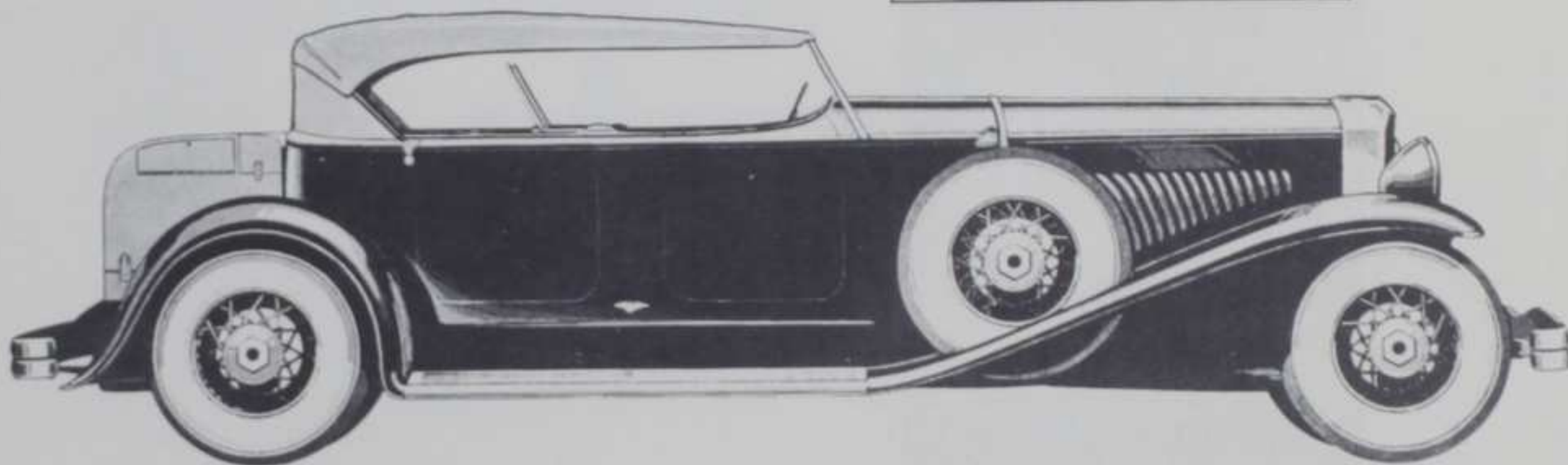
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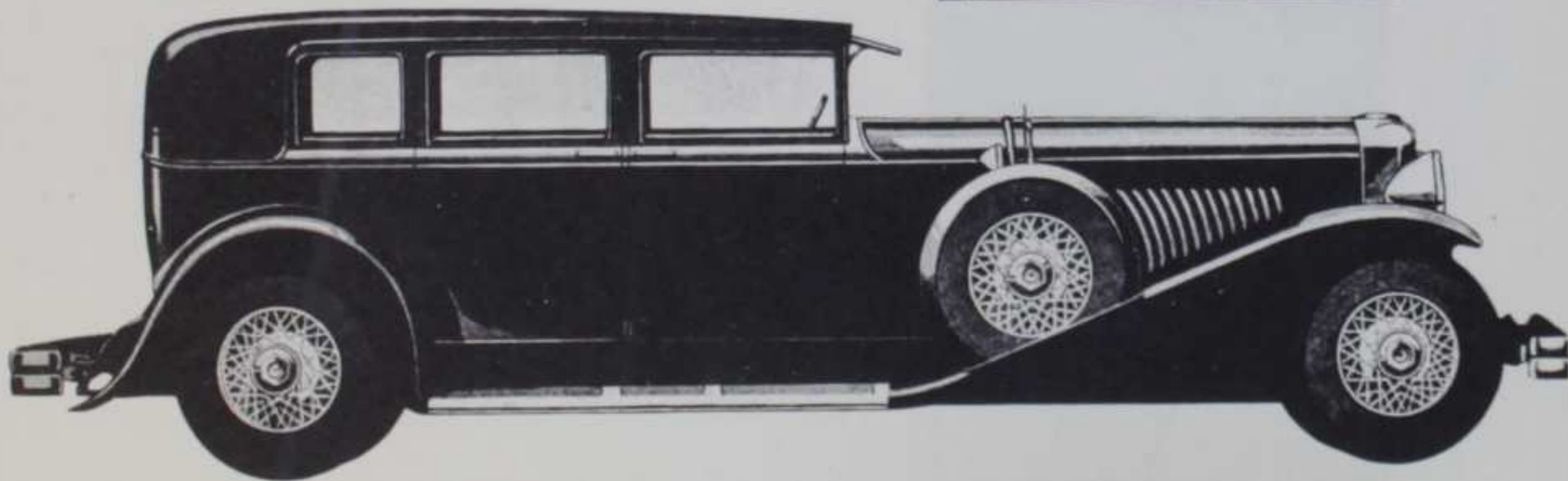
*Specially designed for the long chassis. Tonneau windshield turns down into front seat cowl. Unusual chrome panels add to the attractiveness of the doors. The rubber tile floors are extremely practical.*



THE DUESENBERG TOURSTER



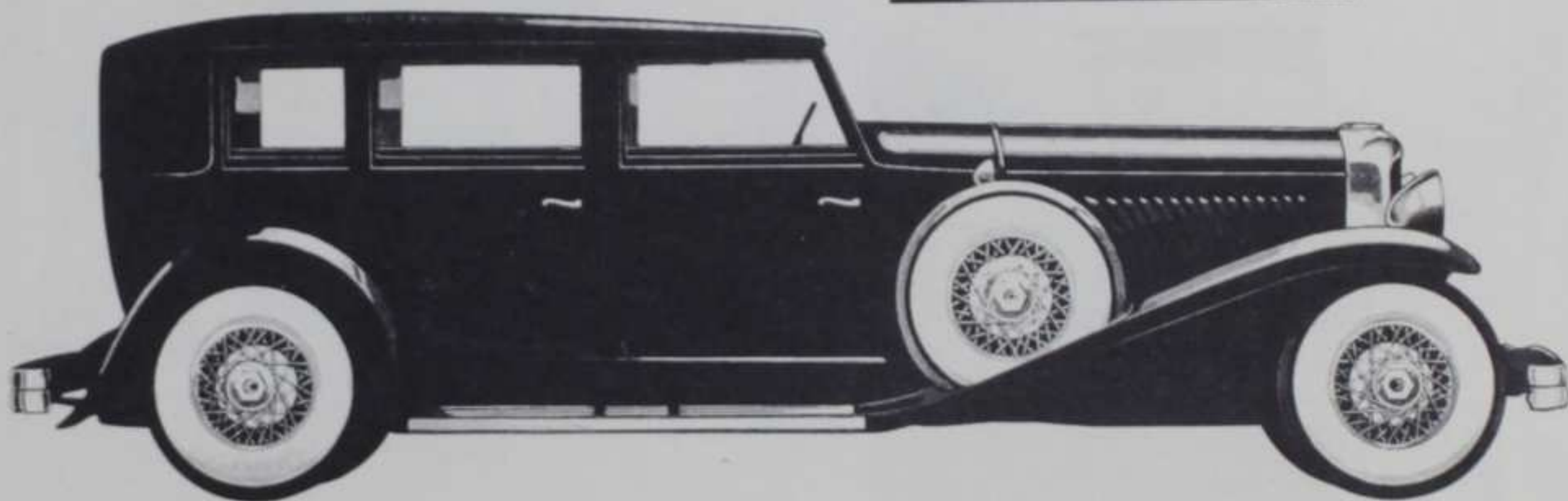
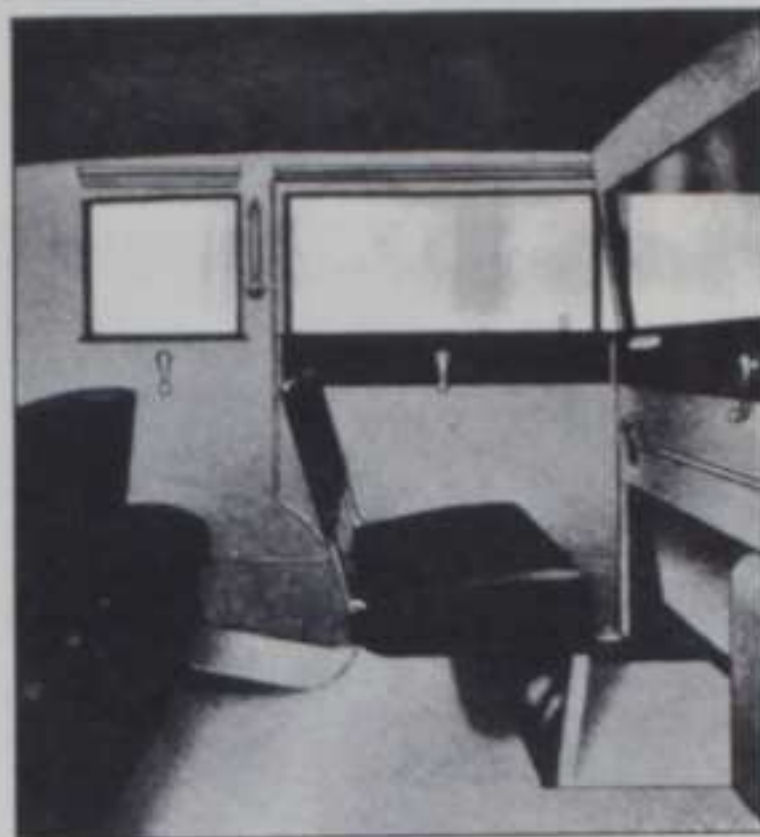
*Unusual body width has been the aim in this design. Six persons ride comfortably in the rear compartment. The large upholstered auxiliary chairs fold completely out of sight. The rear seat is adjustable.*



THE DUESENBERG LIMOUSINE



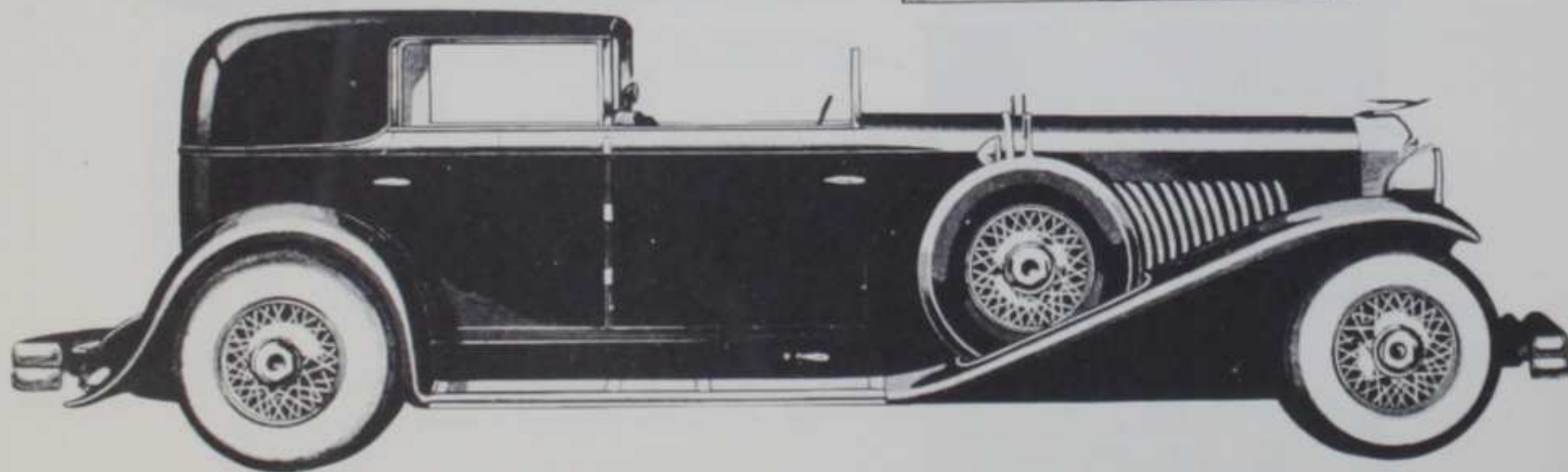
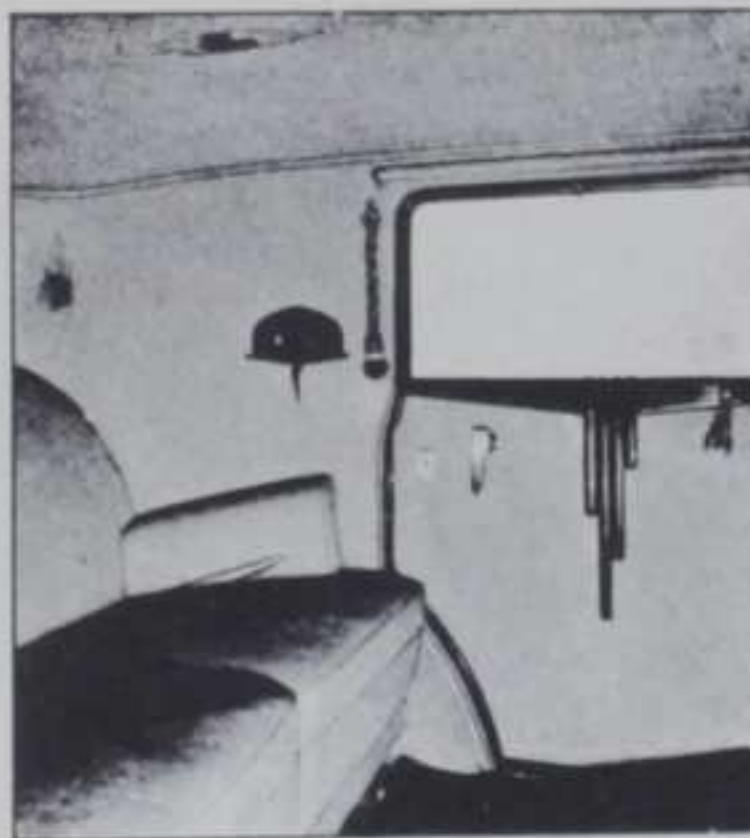
*This model is designed especially for those desiring maximum comfort and exceptional headroom. It has high windows affording excellent vision. Large, high doors permit comfortable entrance. Body lines are of the square, formal type.*



THE DUESENBERG TOWN LIMOUSINE



*Unusual features of this model are long, low, rakish lines; exceptional vision due to thin, duraluminum corner posts; modernistic interior; harmonizing hardware and lights; ebony woodwork; two rear-facing occasional chairs.*



THE DUESENBERG TOWN CAR



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by FLOYD CLYMER

*Foreword by James Melton*

225 pages

500 Illustrations

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America's favorite topic of conversation today, save for perhaps the weather and the Russians, is the automobile. Yet only fifty years ago the automobile was a coughing, rattling, smoking apparition that scared horses, outraged respectable citizens, and was judged a passing fad. In that half century the automobile industry not only came of age, but wrought great changes in the American way of life.

TREASURY OF EARLY AMERICAN AUTOMOBILES is a large, handsomely designed gift-album of photos, advertisements, songs, cartoons, text, and memories affectionately dedicated to those pioneers of the horseless carriage days. But Mr. Clymer, one of the world's top authorities on automobile history, has created more than just a chronological history-in-photographs of the American automobile. He devotes special sections to the Indianapolis Speedway, the empire of Henry Ford, automobile advertising and slogans, Milady's auto fashions, famous first cars, and the short colorful lives of the steamer and the electric. From the original Selden horseless carriage (1877) to a latter-day version of the immortal Model T (1925), the three hundred or more photographs in this artfully designed album will evoke mirth and memories for the middle-aged and laughter and amazement for the too-young-to-remember. There are 500 illustrations. Mr. Joseph Henry Jackson of the *San Francisco Chronicle* says of this book, "One needs no crystal ball to prophesy best-sellerdom."

FLOYD CLYMER grew up with the American automobile and is a man well qualified to evoke memories of Barney Oldfield, the Stutz Bearcat, the Stanley Steamer, the Glidden Tours, the Octoauto (eight wheels), the Duck (with its back-seat steering wheel), the Tin Lizzie, and that original Horseless Carriage which mounted a life-size horse's head on the radiator. For half a century, Floyd Clymer has tested, raced, and restored American automobiles. He has even invented accessories for them. Teddy Roosevelt called him "the world's youngest automobile salesman" and he once held the motorcycle speed record to the top of Pike's Peak in Colorado. In recent years he has written and published a score of books on the automobile.



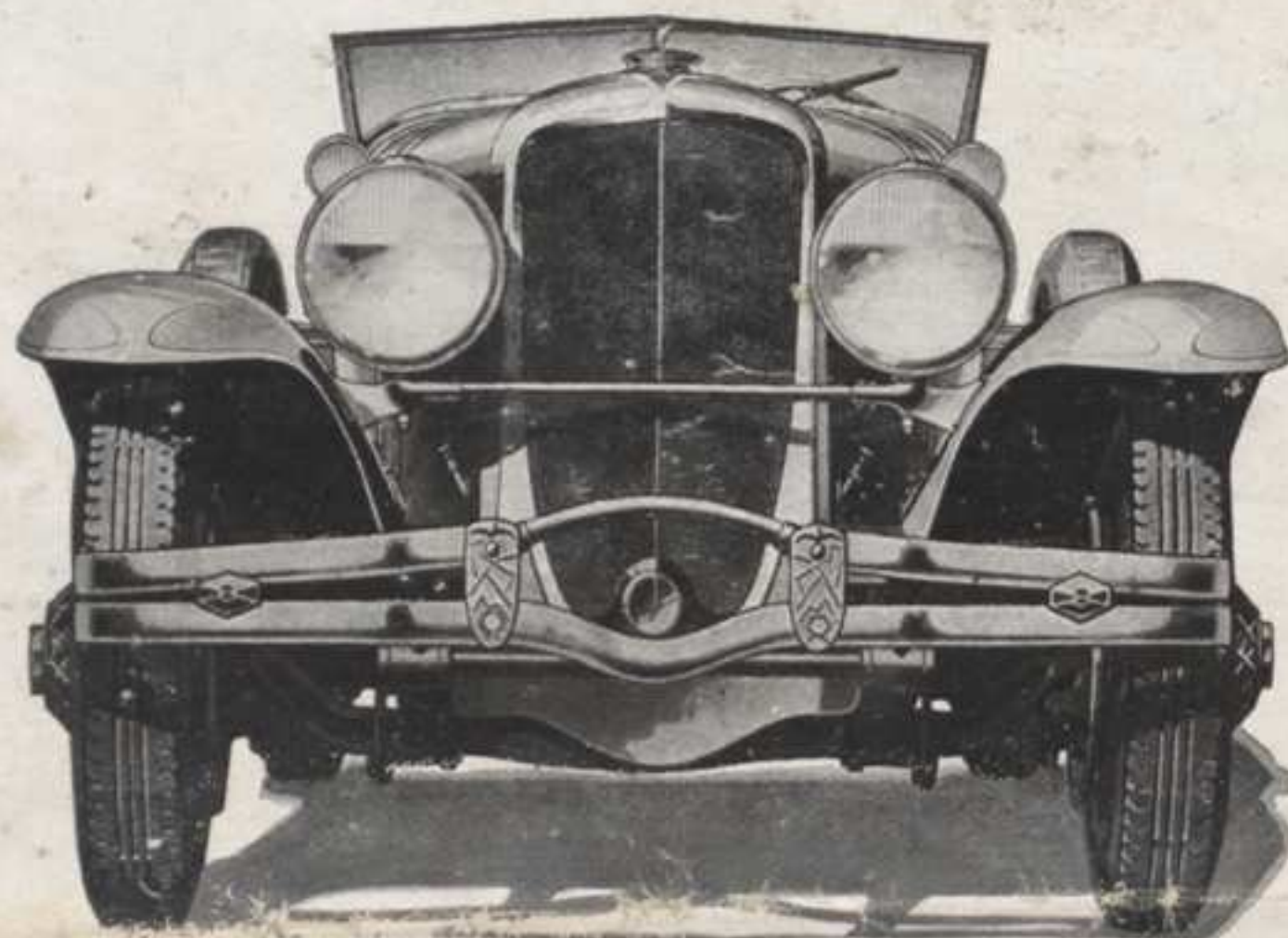
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Clymer Reprint No. 4-JDR



# La Nouvelle DUESENBERG 8

INDIANAPOLIS U. S. A.



*Description d'une voiture automobile de type particulier  
par Harold F. Blanchard, rédacteur technique de  
MoToR. Réimprimé d'un récent numéro MoToR.*

Seul Concessionnaire pour la France

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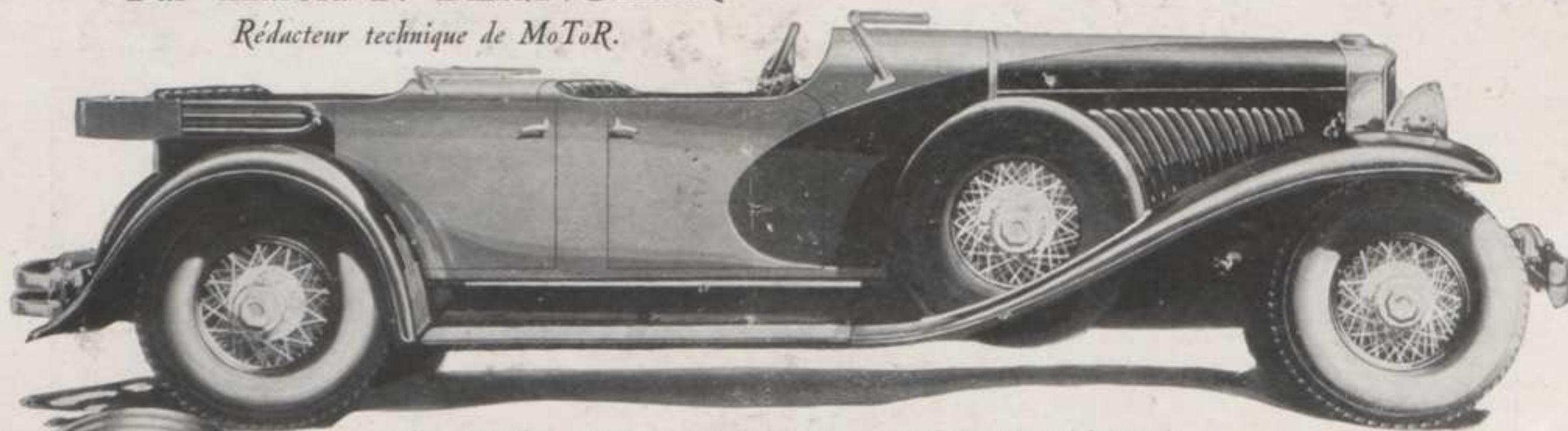


Trade  
Cat  
D815  
193-

# 40/265 Chevaux Vapeur...

Par Harold F. BLANCHAR

Rédacteur technique de MoToR.



Cette voiture de tourisme à carrosserie ouverte, quatre places, est un bel exemple d'harmonie des lignes. Remarquer le fond du capot, des garde-boues, de la roue de rechange et des jalousies du capot.

LORSQUE en 1926, M. E.-L. Cord, président de la "Auburn", prit le contrôle de la Duesenberg Inc. d'Indianapolis, il fit savoir qu'avec l'aide de Fred S. Duesenberg, il avait l'intention de mettre au point la meilleure voiture du monde : une voiture ayant une accélération inconnue jusqu'ici, à grande vitesse, pouvant facilement grimper les côtes les plus raides, sûre et agréable à conduire, voiture de longue durée, en qui on pouvait avoir la confiance la plus absolue, construite par des spécialistes des plus avertis, avec des matériaux de qualité supérieure sous la direction de Duesenberg, constructeur de génie à la fois des voitures de course et des voitures de tourisme.

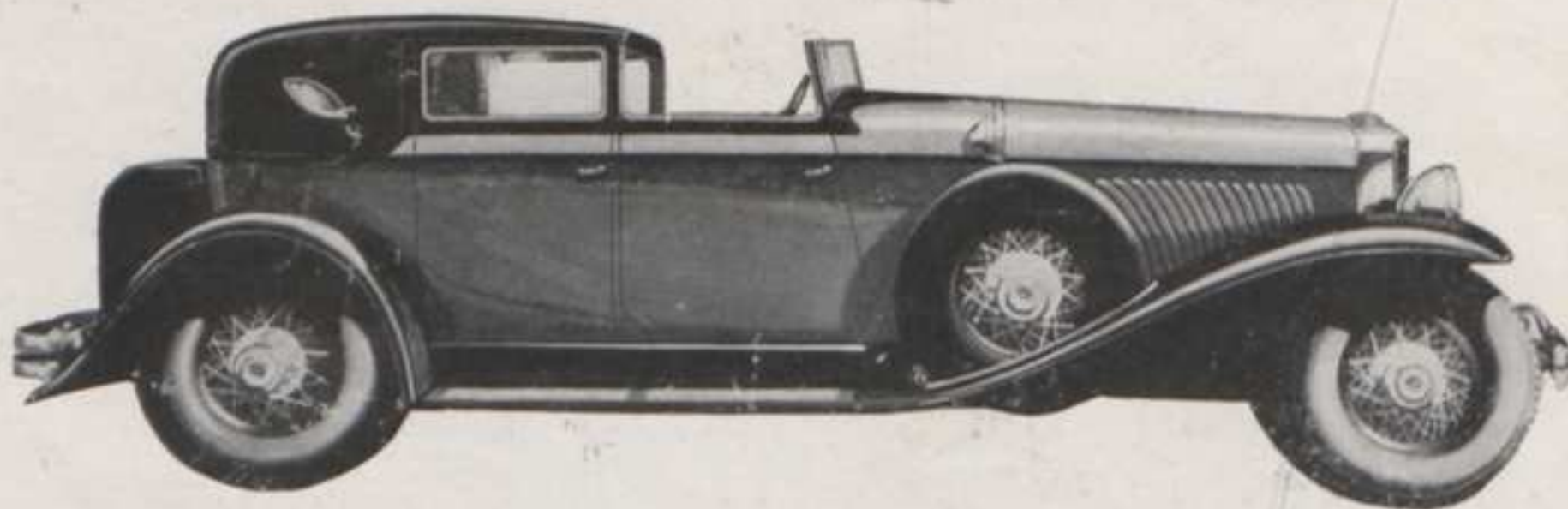
Toutes ces conditions ont été réalisées dans la nouvelle Duesenberg 8 où l'on trouve la construction la plus précieuse et en même temps la plus robuste, et qui a été

réalisée en partant de matériaux les meilleurs mis à la disposition des spécialistes choisis parmi les plus qualifiés. Cette voiture possède la rapidité, la puissance et l'accélération d'une voiture de course, tout en ayant les dimensions, le confort, la souplesse, la durée et la sécurité qui sont les caractéristiques principales d'une voiture de tourisme quelle qu'elle soit.

La caractéristique principale de cette voiture est qu'elle possède un groupe moteur comprenant 8 cylindres en ligne capables de développer une puissance de 265 CV, placés sur un châssis habilement conçu pour pouvoir supporter cette énorme réserve de puissance dans les meilleures conditions possibles de sécurité.

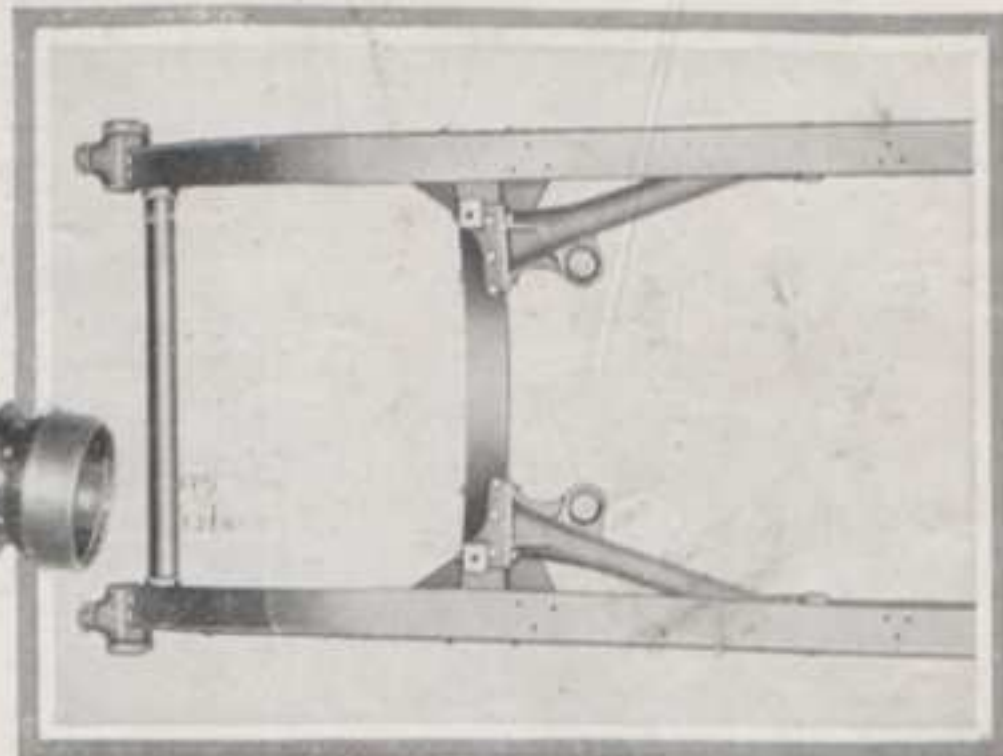
La vitesse maximum que peut atteindre ce châssis sur un parcours en ligne droite n'a pas encore été déterminée, mais il a parcouru sur le circuit d'Indianapolis 185 km, dans l'heure, étant équipé avec une carrosserie de 4 places munie d'un coupe-vent. Ce même châssis a parcouru 140 km, dans l'heure en deuxième position (rappelons que sa boîte de transmission comporte 3 vitesses). Evidemment, cette vitesse fantastique n'intéresse pas la majorité des acheteurs, mais elle indique néanmoins comment, sans effort, la voiture pourra rouler à des vitesses représentant des moyennes élevées. Parcourir plus de 1.500 mètres à la minute représente déjà une allure remarquable, cette voiture peut faire plus de 130 km. à l'heure et sa

L'ensemble piston et bielle ne pèse que 1.700 grammes. Noter les ailettes de refroidissement à la partie inférieure.



Le cabriolet tous temps est fini en deux teintes marron clair avec bande jaune or, la teinte la plus claire est disposée sur les panneaux de la carrosserie et au sommet du capot. La carrosserie est de Holbrook.

Essieu arrière montrant les tambours de frein pourvus d'ailettes de refroidissement et diverses autres caractéristiques. En haut : le tablier en aluminium coulé traité thermiquement. A droite : Extrémité avant du châssis montrant les étais en "A" qui rendent l'avant particulièrement rigide.





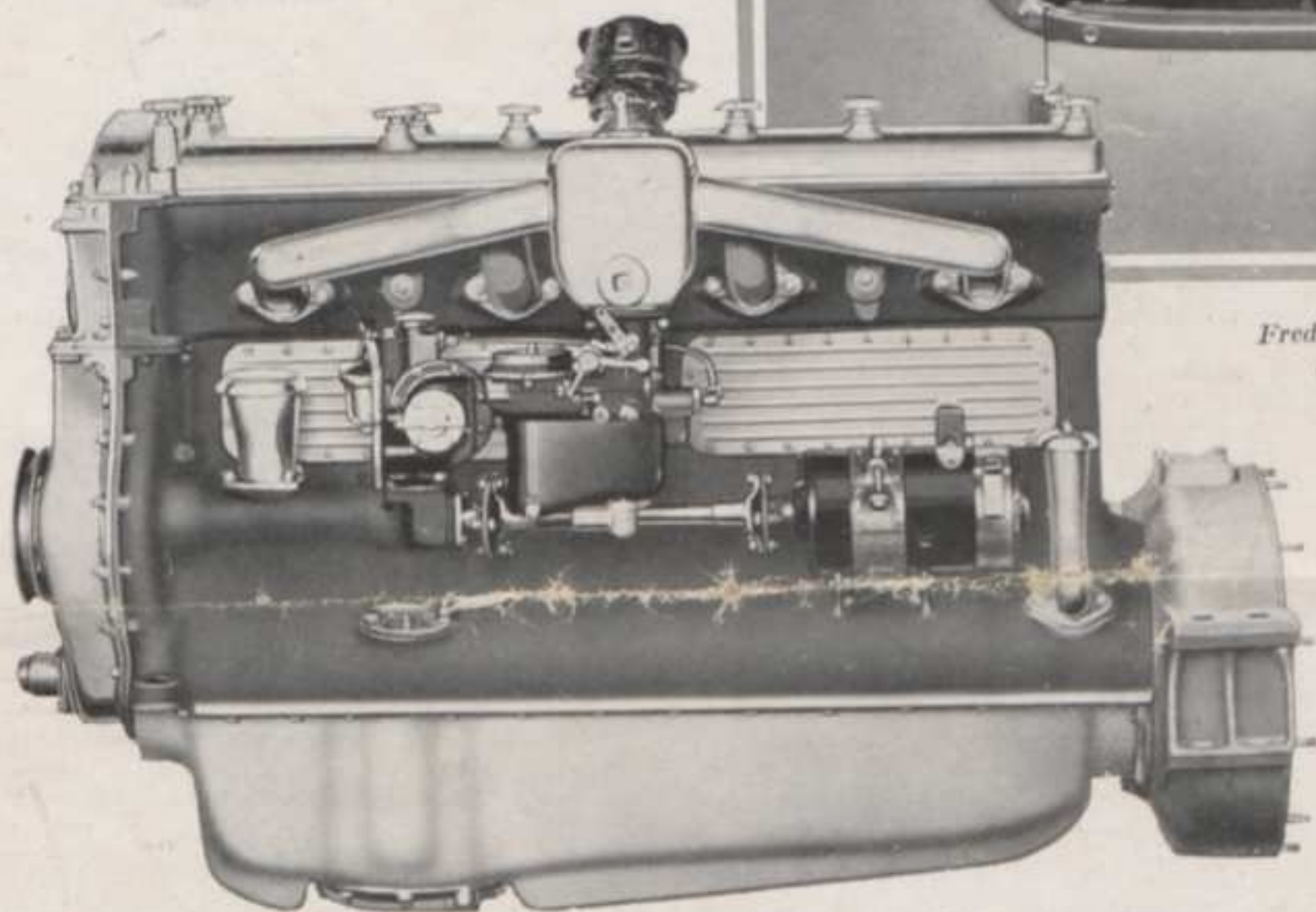
# ...190 Kilomètres à l'Heure

## DUESENBERG

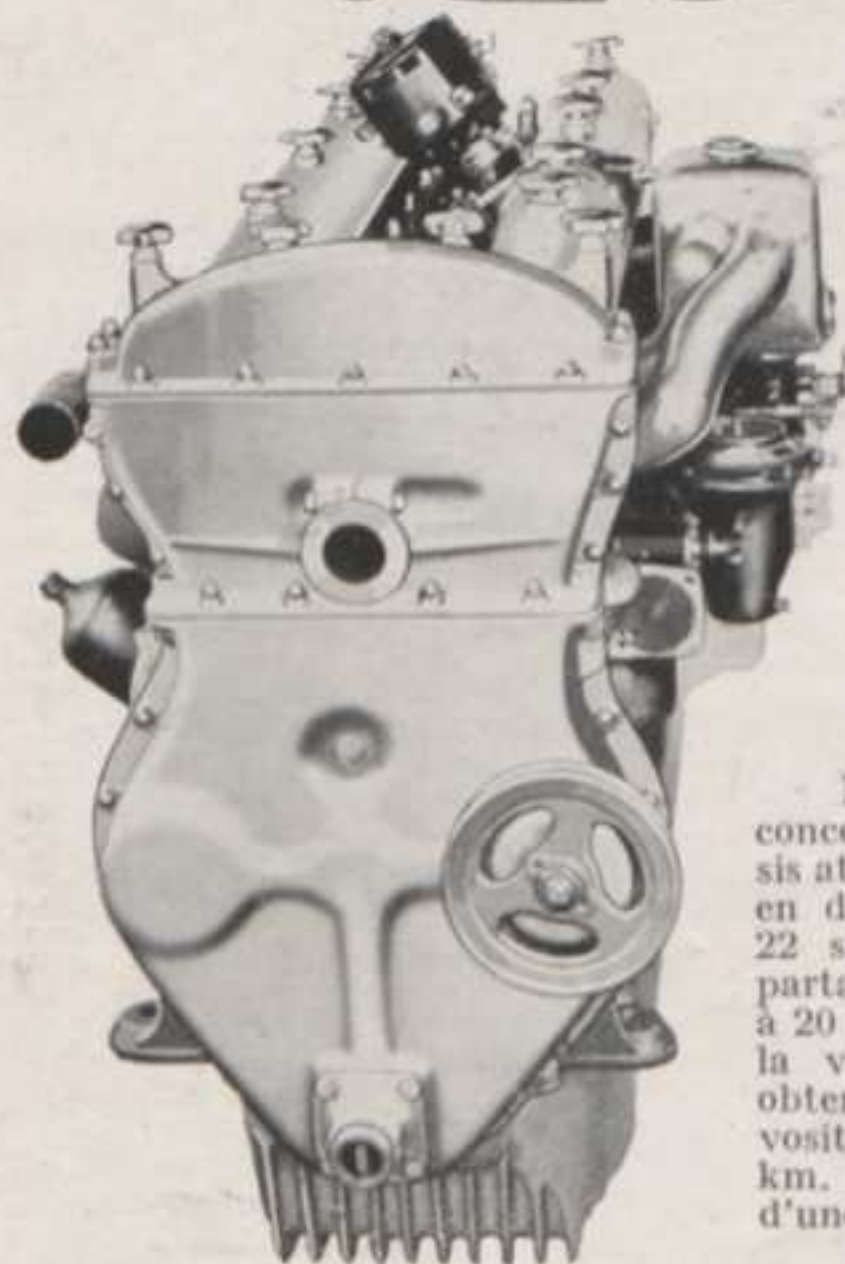
présente sa  
Voiture Extraordinaire  
avec Châssis au Prix  
de Francs : 395.000



Fred S. DUESENBERG  
qui a conçu la voiture.



Côté gauche du moteur  
montrant le collec-  
teur d'aspiration et le  
carburateur avec pompe  
à essence directement en  
avant du carburateur.  
A gauche, vue avant du  
moteur.



stabilité à cette allure  
est aussi parfaite que  
celle des voitures se  
déplaçant à la vitesse  
de 60 à 70 km. à  
l'heure. Cette stabi-  
lité est due particu-  
lièrement à une rigidité  
tout à fait remarqua-  
ble du châssis.

Même remarque en ce qui  
concerne l'accélération, le châs-  
sis atteint les 130 km. à l'heure  
en des délais très courts, en  
22 secondes exactement, en  
partant d'une vitesse inférieure  
à 20 km. Cette accélération et  
la vitesse de 130 km. sont  
obtenues avec autant de ner-  
vosité que sont obtenus les 50  
km. à l'heure d'une voiture  
d'une puissance moyenne.

Cet avantage est encore

plus apprécié lorsque l'on songe que la voiture  
se déplaçant à la vitesse de 120 km. exige une  
force de 75 CV. ; le moteur développant une  
puissance de 175 CV. il reste donc 100 CV. en  
réserve pour assurer une accélération rapide.

Les qualités du châssis aux faibles vitesses  
sont tout autant remarquables. Le châssis passe  
d'une vitesse de 8 km. à l'heure à 40 km. en  
5 secondes à peine, et par suite de sa réserve  
énorme de puissance, la facilité avec laquelle il  
grimpe les côtes est aussi étonnante que sa  
vitesse et son accélération.

Il n'existe pas de côtes, les plus raides soient-  
elles, qui ne puissent être grimpées avec facilité  
par cette voiture. Mais il est impossible à

l'auteur d'exposer ici avec plus de détails les performances remar-  
quables de ce nouveau châssis.

Etant donnée la puissance remarquable de cette voiture et l'écar-  
tement de ses essieux (qui est de 3 m. 60 pour le châssis 5 places et  
de 3 m. 90 pour le châssis 7 places), son poids total de 2.000 kilos  
environ, lorsque le châssis est muni d'une carrosserie 4 places, est  
exceptionnellement bas, surtout si l'on songe que les différentes  
pièces qui constituent le châssis présentent une résistance qui, en  
moyenne, est de 50 % supérieure à celle des pièces des autres châssis  
de bonne marque.

Ce poids relativement bas a été obtenu :

1° Par un emploi très grand de l'aluminium ; de plus, pour  
toutes les pièces en aluminium, on a utilisé un métal ayant subi un  
traitement thermique qui le rend trois fois plus résistant que l'alumi-  
nium n'ayant pas subi de traitement.

2° Par l'adoption de pièces forgées là où la fonte malléable  
était ordinairement employée.

3° Par l'emploi de matériaux de qualité supérieure.

4° Par l'ajourage de toutes les pièces forgées.

En même temps que la nouvelle Duesenberg possède la vitesse  
que nous venons d'indiquer et qui est celle d'une voiture de course,  
on trouve chez elle toutes les qualités que l'on est habitué à rencon-  
trer dans une voiture de tourisme de marque.

La conduite de la voiture est aisée et la direction est très sensible  
au moindre déplacement du volant ; la voiture peut être braquée  
dans des conditions inusitées au moyen d'un dispositif spécial com-  
biné par Fred Duesenberg.

La voiture prend les tournants d'une façon très élégante et donne



à celui qui la conduit une sensation parfaite de sécurité due à de nombreux facteurs, en particulier à un équilibrage parfait du châssis et un centre de gravité très bas.

La partie supérieure du cadre du châssis est à 0 m. 50 du sol, quoique la voiture semble être beaucoup plus surbaissée que ne l'indique ce chiffre. On a obtenu ce centre de gravité bas en plaçant le centre du pignon de l'arbre de transmission à 5 centimètres au-dessous du centre de l'essieu arrière.

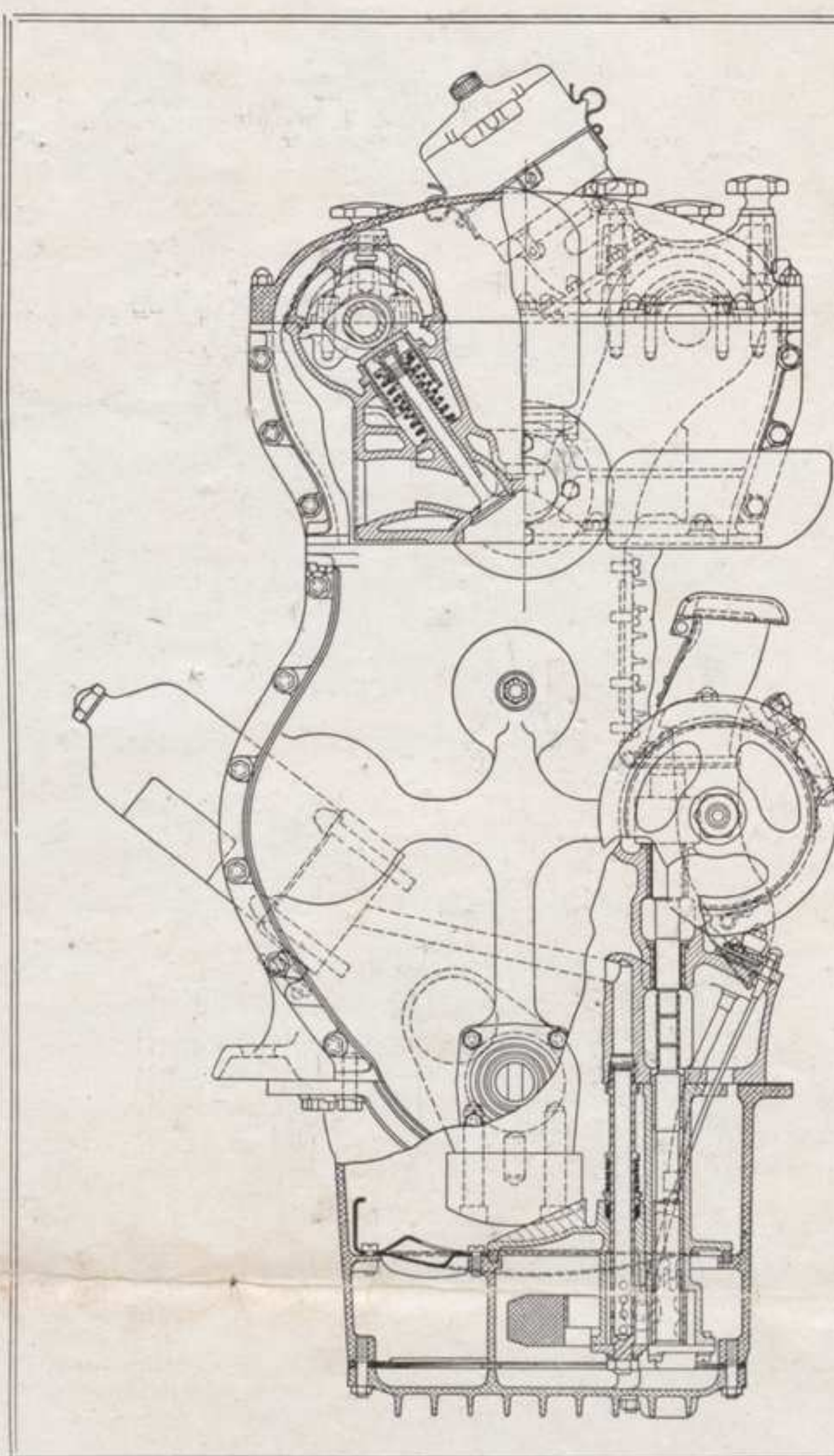
En résumé, la voiture est à la fois puissante et agréable à l'œil. Ses lignes expriment à la fois la puissance, la vitesse et l'élégance, sans la moindre note fausse. Les lignes du radiateurs et celles de la capote sont différentes de ce qui a été vu jusqu'ici et ceci, en conjonction avec d'autres détails tels que la longueur des pare-chocs différente de celle à laquelle on est habitué, donne à l'ensemble une allure riche et véritablement distinguée.

Tous les accessoires que l'on est habitué de rencontrer sur les châssis, ici comme à l'étranger, existent sur le châssis de la Duesenberg. Le prix de ce châssis est de 8.500 dollars, y compris la fourniture de pare-chocs, de 4 amortisseurs Delco-Remy, de 6 roues métalliques dont 2 de rechange, placées dans des gaines protectrices et supportées par des consoles robustes boulonnées au cadre du châssis. Ce châssis peut être livré suivant les désirs du client avec une démultiplication variant de 3,5 à 4,5.

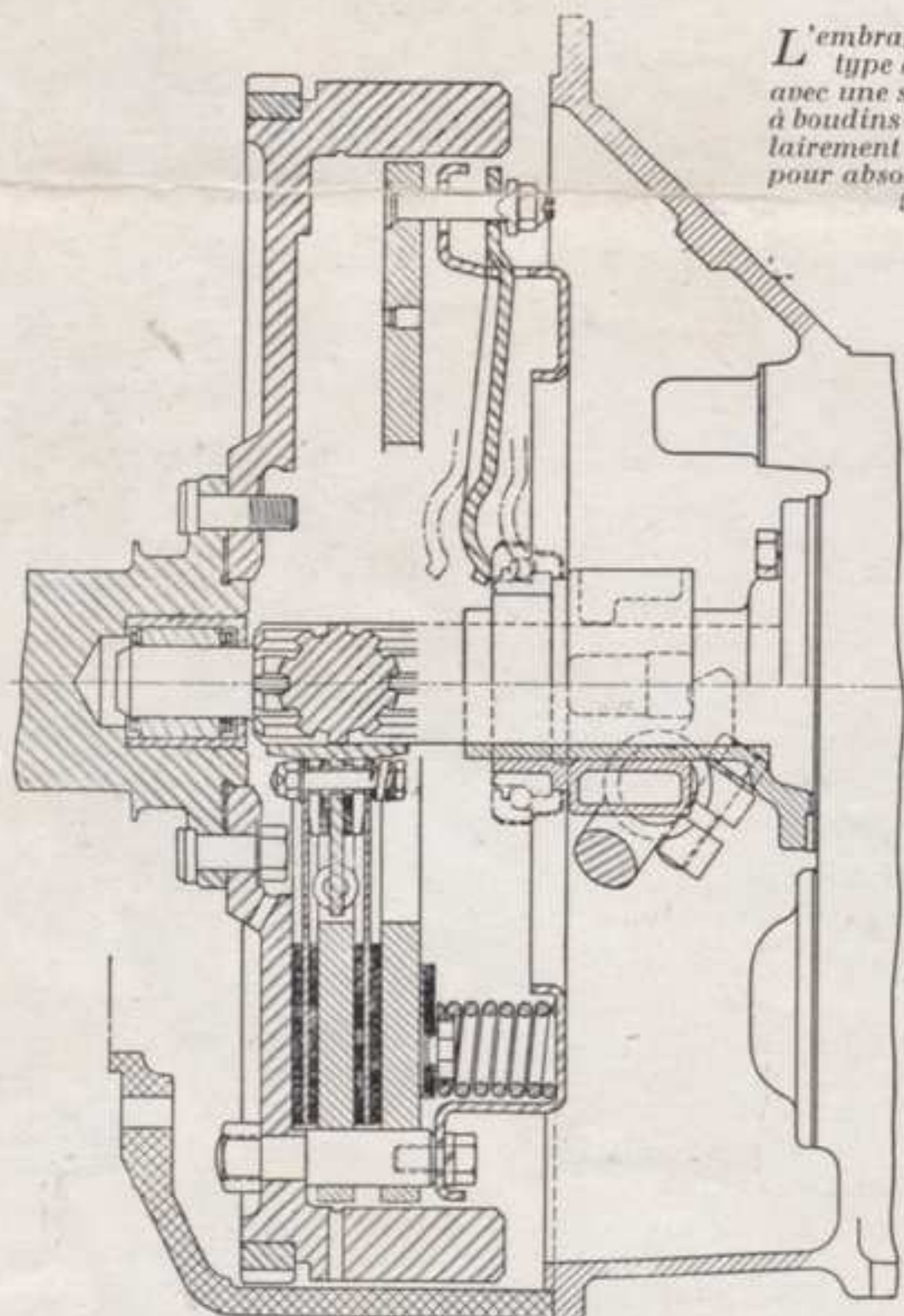
Il est facile de se rendre compte de la puissance développée par le moteur, qui est au maximum de 265 CV. quand le moteur tourne à 4.200 tours par minute, lorsque l'on examine de plus près sa construction. Avec sa capacité de 5,5 litres, il constitue le moteur le plus important qui ait été jusqu'ici placé sur une voiture automobile de tourisme.

Jusqu'à un certain point, ce moteur rappelle celui des voitures de course, quoiqu'il ne soit pas muni d'un compresseur, puisqu'il développe une puissance largement suffisante sans ce compresseur. En particulier, le mécanisme des soupapes rappelle celui des voitures de courses en ce que la partie supérieure mobile des cylindres supporte 2 arbres à cames, l'un pour les soupapes d'admission, l'autre pour les soupapes d'échappement, les cames agissant sur des butées fixées directement à la tige des soupapes.

Etant données les dimensions du moteur, on a prévu deux soupapes d'admission et 2 soupapes d'échappement par cylindre, ainsi qu'on

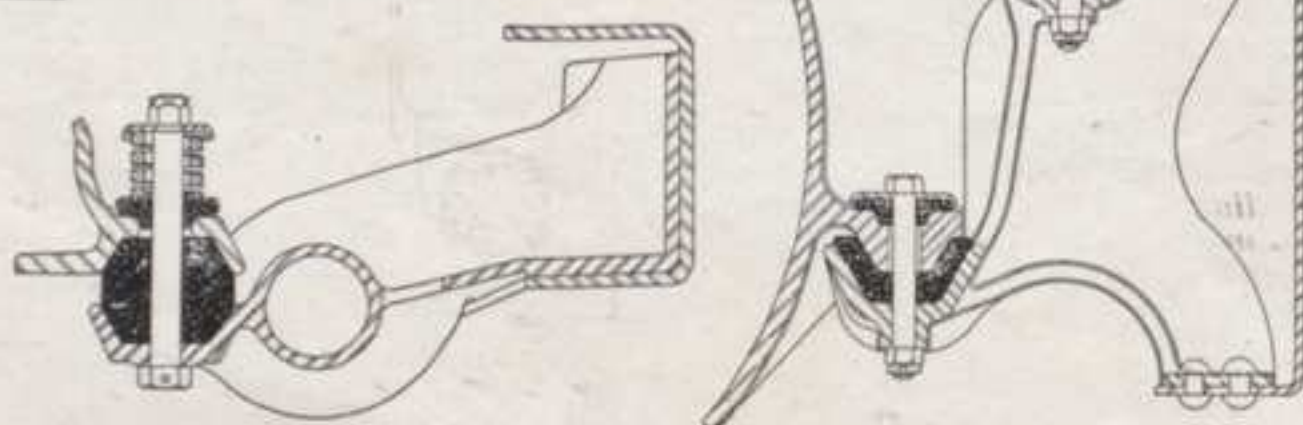


*L'embrayage est du type à deux disques avec une série de ressorts à boudins disposés circulairement dans le boîtier pour absorber les vibrations.*



*Les montages de supports arrière du moteur, à double garniture de caoutchouc, sont placés entre eux à une distance suffisante pour fixer le moteur de façon très rigide, et cependant les garnitures élastiques qui isolent complètement le moteur du châssis absorbent toutes les petites vibrations à l'avant.*

*A l'avant, le moteur repose sur des supports simples: le boulon de fixation agit avec interposition de ressorts à boudin, de sorte que, dans le cas très rare d'une déformation du châssis, ces ressorts préviennent la déformation du carter du moteur.*



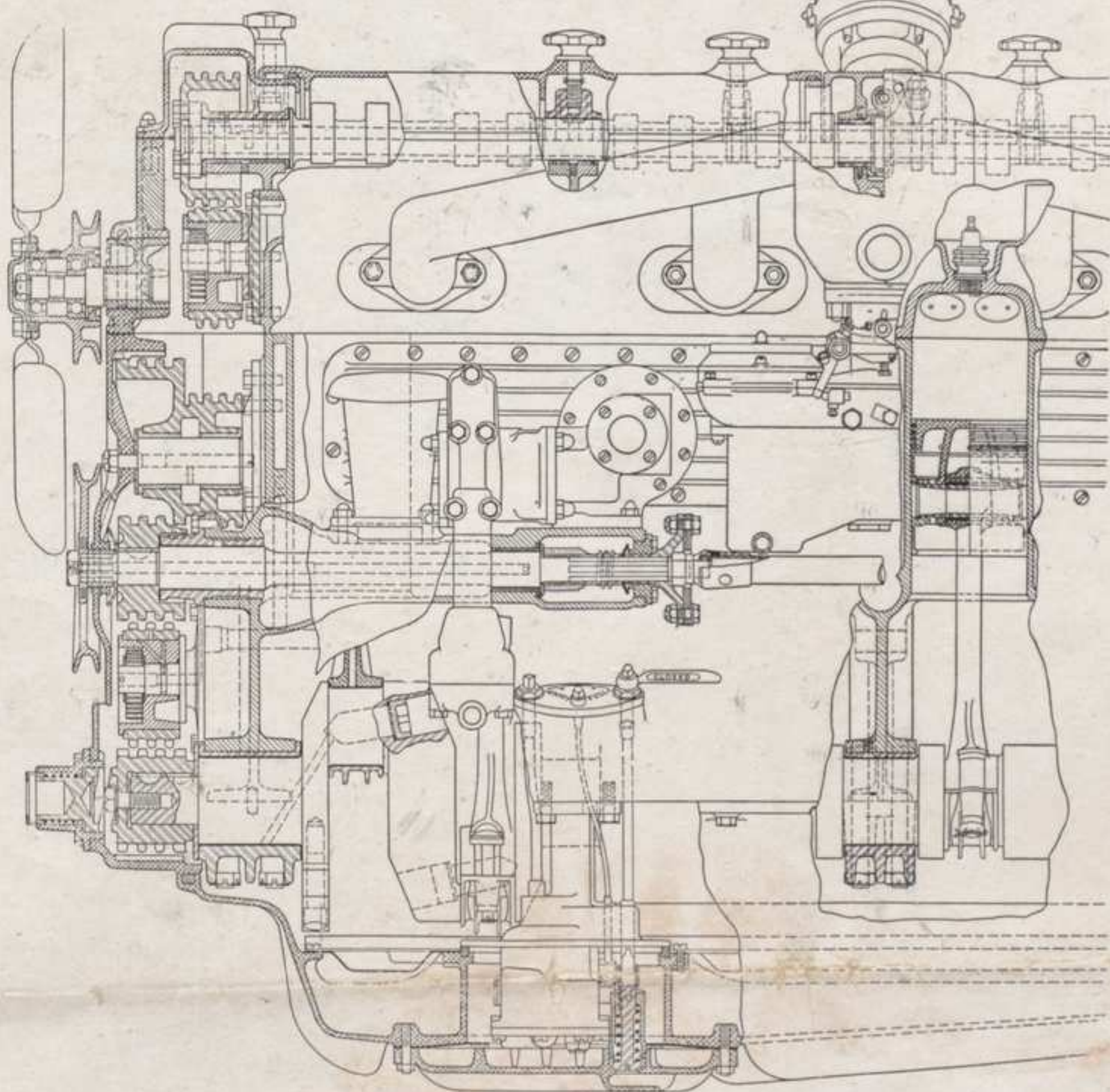
le faisait il y a quelques années sur un grand nombre de voitures de courses. L'emploi de ces 4 soupapes par cylindre, au lieu de 2 qui sont habituellement employées, permet l'utilisation de soupapes légèrement plus petites dont le refroidissement est plus efficace. Les sièges de ces soupapes sont entièrement refroidis par une circulation d'eau, et les guides des tiges de soupapes sont également refroidies par la circulation d'eau sur presque toute leur longueur.

La puissance exceptionnelle du moteur et la vitesse de rotation élevée qu'il peut atteindre sont dues en grande partie à l'efficacité du système de refroidissement des soupapes et au passage offert aux gaz d'admission et d'échappement par les 4 soupapes de chaque cylindre. Les soupapes d'admission ont un diamètre de 3,75  $\frac{c}{m}$  et elles se déplacent verticalement d'une hauteur de 8  $\frac{m}{m}$  environ. Les soupapes d'échappement ont un diamètre de 4,7  $\frac{c}{m}$  et se déplacent verticalement de 9  $\frac{m}{m}$  environ. Ces soupapes portent en outre, des dispositifs spéciaux pour réaliser une fermeture et une ouverture silencieuses. Toutes ces soupapes sont en acier au chrome silicium.

L'arbre à cames est commandé sur la partie avant par une chaîne silencieuse liée à un arbre intermédiaire, lui-même commandé par le vilebrequin par l'intermédiaire d'une seconde chaîne. Ces deux chaînes sont munies d'un dispositif automatique qui leur assure une tension permanente.

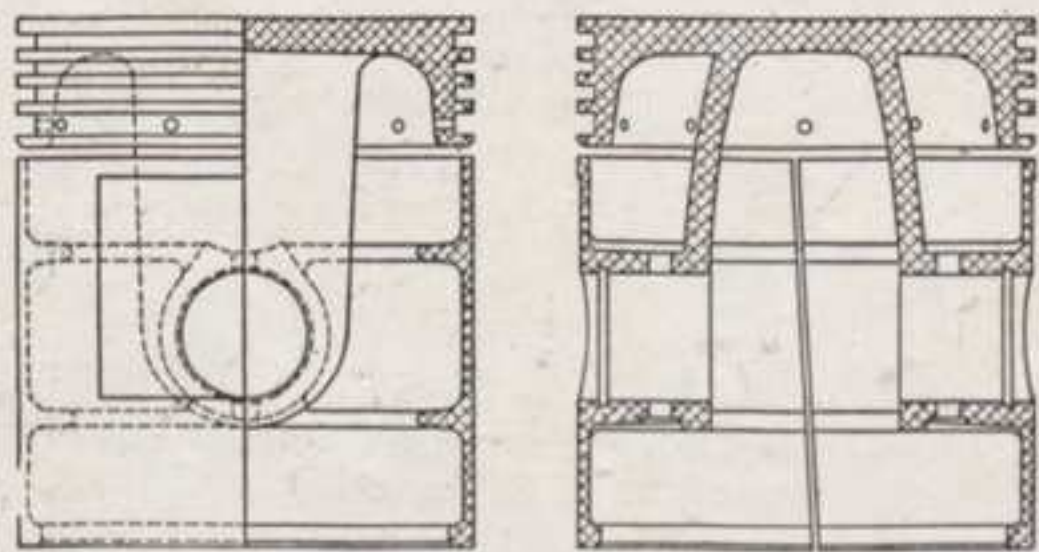


Coups en élévation de face et de profil du moteur, montrant ses principales caractéristiques, dont les arbres à cames en tête, l'arbre vilebrequin équilibré, les roues de la chaîne de distribution, le système de graissage, etc. L'amortisseur de vibration n'est pas représenté.



La chambre de combustion est entièrement usinée, et l'étincelle est localisée dans le centre de cette chambre elle-même entièrement refroidie par un courant d'eau. Le taux de compression est au minimum de 5,2 et augmente lorsque la vitesse du moteur augmente, pour atteindre une valeur de 6 lorsque la vitesse de la voiture est d'environ 100 km. à l'heure.

Le bloc-cylindre, ainsi que la moitié supérieure du carter, sont en fonte grise soigneusement sélectionnée. Les pistons sont en alliage d'aluminium Ray-Day et portent 3 segments d'étanchéité et 1 segment d'huile placés au-dessus de l'axe du piston. Toutes les pièces entrant dans la fabrication de ces pistons sont particulièrement sélectionnées.



La caractéristique du piston Ray-Day en alliage d'aluminium est son mode de compensation de la dilatation. La chemise du piston est sectionnée en un point comme le montre la figure et est entièrement séparée du fond qui porte les segments, sauf deux longs bossages qui relient la chemise au fond. La distance entre ces bossages a été déterminée soigneusement de façon que la dilatation du fond du piston entre les supports des bossages soit égale à la dilatation du cylindre en fonte ; de cette façon le piston s'ajuste exactement dans le cylindre, à froid et à chaud.

La bielle de chaque piston est constituée par un alliage d'aluminium de section en I comme les bielles habituelles, mais ayant un certain nombre de points particuliers. La tête de la bielle qui est liée au vilebrequin est plus rigide que les bielles courantes, car l'emplacement prévu pour loger la tête des boulons n'est pas aussi profond que les emplacements courants. Ce dispositif permet de remplacer les boulons ordinaires à tête hexagonale par un boulon à tête ronde, portant une face plate qui vient se fixer sur la paroi verticale du logement de la tête du boulon. La tête de bielle a été spécialement étudiée pour offrir un maximum de dissipation de la chaleur et la partie mobile de la tête de bielle également est cannelée pour offrir à la fois une plus grande rigidité et un maximum de dissipation de la chaleur.

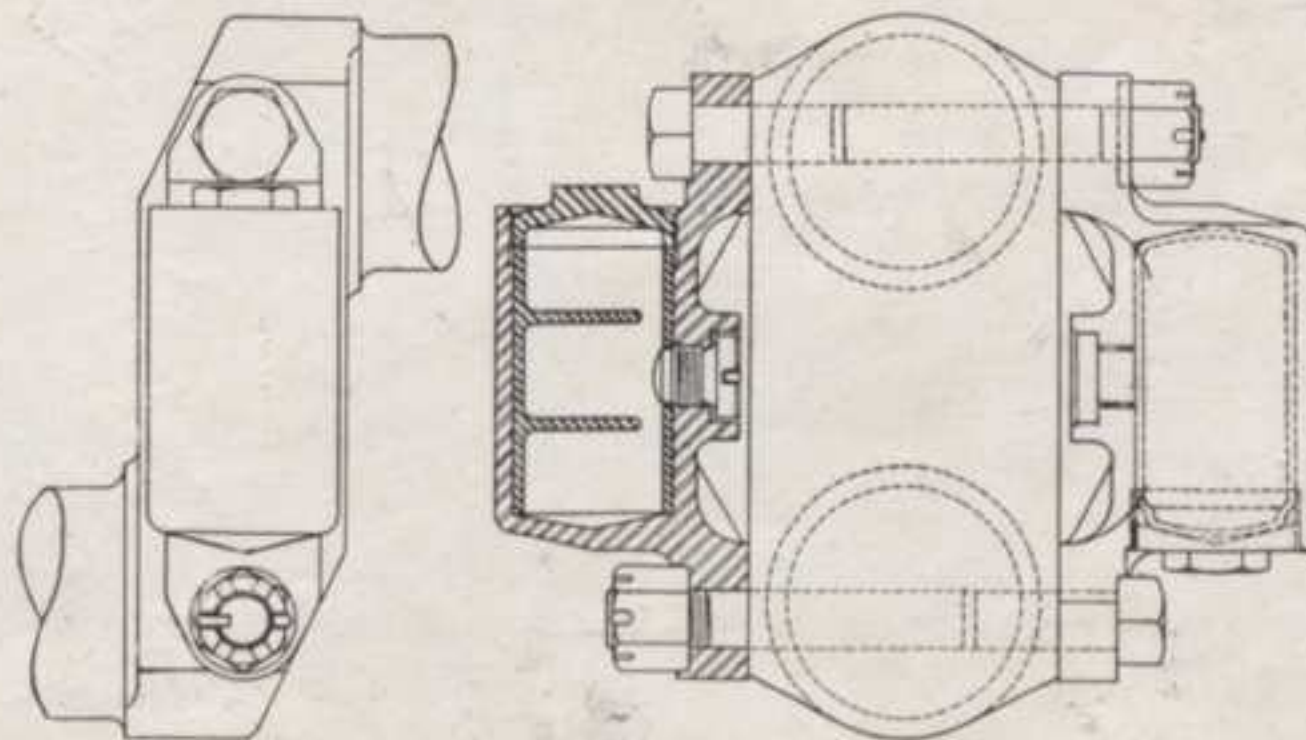
Le vilebrequin est constitué par un arbre en acier au chrome et au nickel forgé, portant 5 tourillons de 7  $\frac{1}{2}$  de diamètre et ayant la longueur suivante depuis la partie avant, jusqu'à la partie arrière : 8,5, 4,6, 6, 4,6 et 7  $\frac{1}{2}$  environ. Ce vilebrequin est très exactement équilibré à la fois statiquement et dynamiquement.

Le point le plus intéressant à signaler dans ce vilebrequin est le dispositif prévu pour l'annulation des vibrations, dispositif particulièrement simple et cependant très efficace et qui est formé de 2 tubes boulonnés sur les côtés opposés du bras de manivelle situé entre les cylindres n° 1 et n° 2. Chacun de ces tubes est rempli aux 94 % de son volume de mercure.

Lorsque le vilebrequin commence à vibrer, il se déplace alternativement dans une direction, puis dans l'autre, obligeant ainsi le mercure à se déplacer et en particulier à passer entre deux chicanes. Il

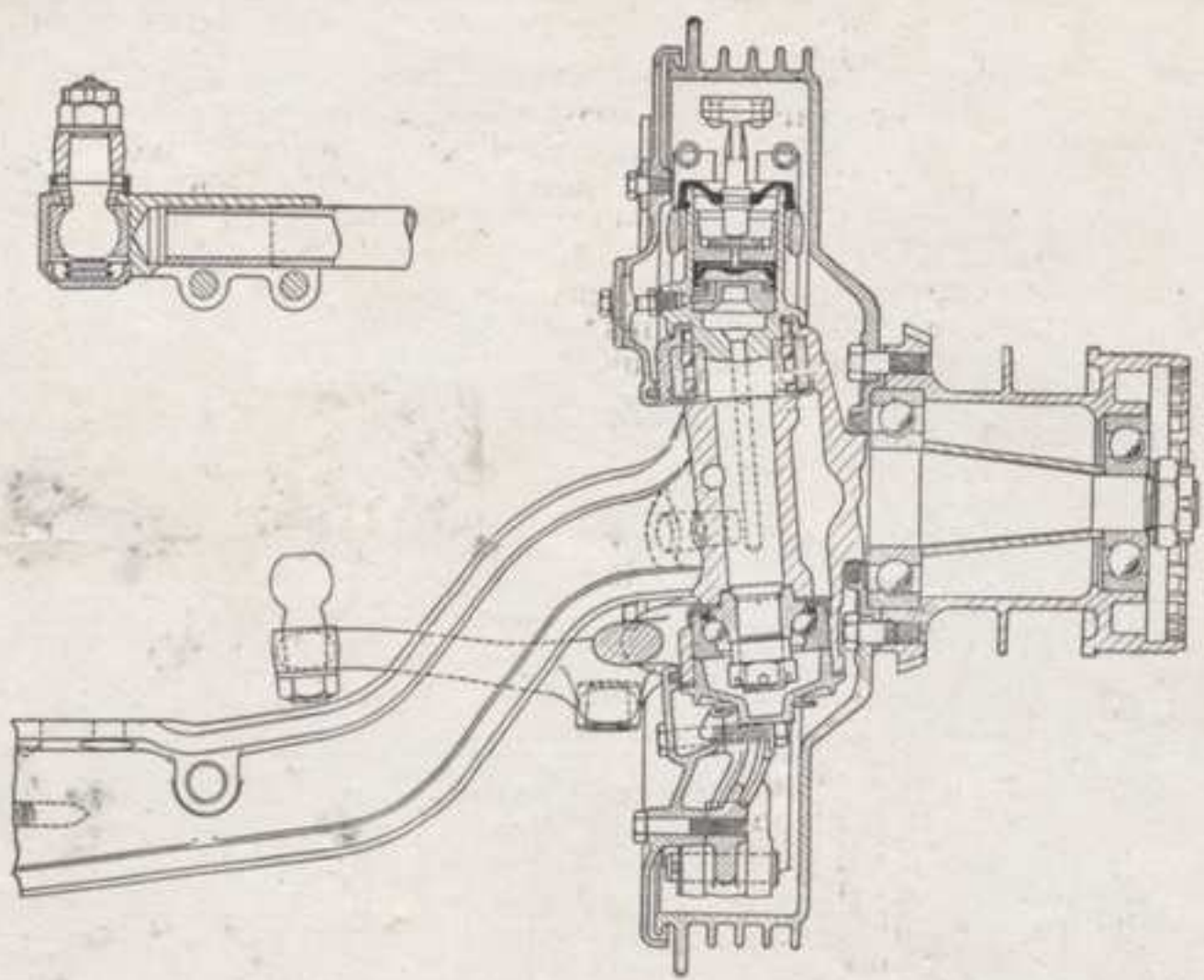
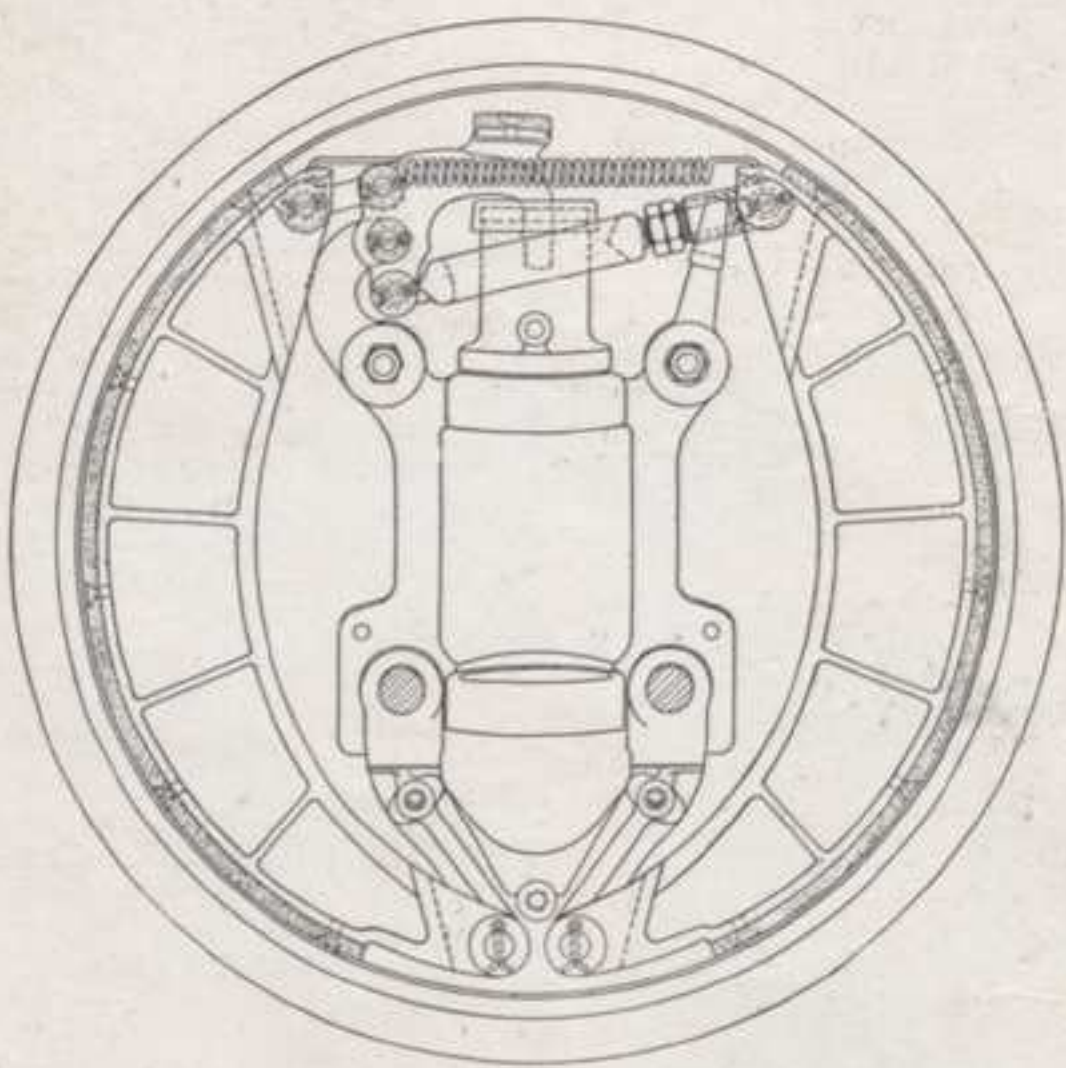
en résulte un frottement des molécules du mercure les unes sur les autres et du mercure sur les chicanes qui est suffisant pour amortir complètement les vibrations du vilebrequin avant que celles-ci deviennent sensibles. Rien n'est plus simple que ce dispositif, mais il est néanmoins particulièrement efficace et l'auteur, ayant eu l'occasion de conduire cette voiture, n'a observé aucune vibration du vilebrequin.

La mise au point d'une voiture d'une telle puissance, très loin de celles qui ont été précédemment construites, a nécessité la solution de nouveaux problèmes, en particulier dans l'alimentation et dans le départ des gaz d'échappement. Il n'existait pas, en particulier dans la construction automobile, de pot d'échappement capable



L'amortisseur de vibration consiste en deux cartouches remplies aux 94 centièmes de mercure et fixées de part et d'autre de la manivelle entre les cylindres n° 1 et 2.





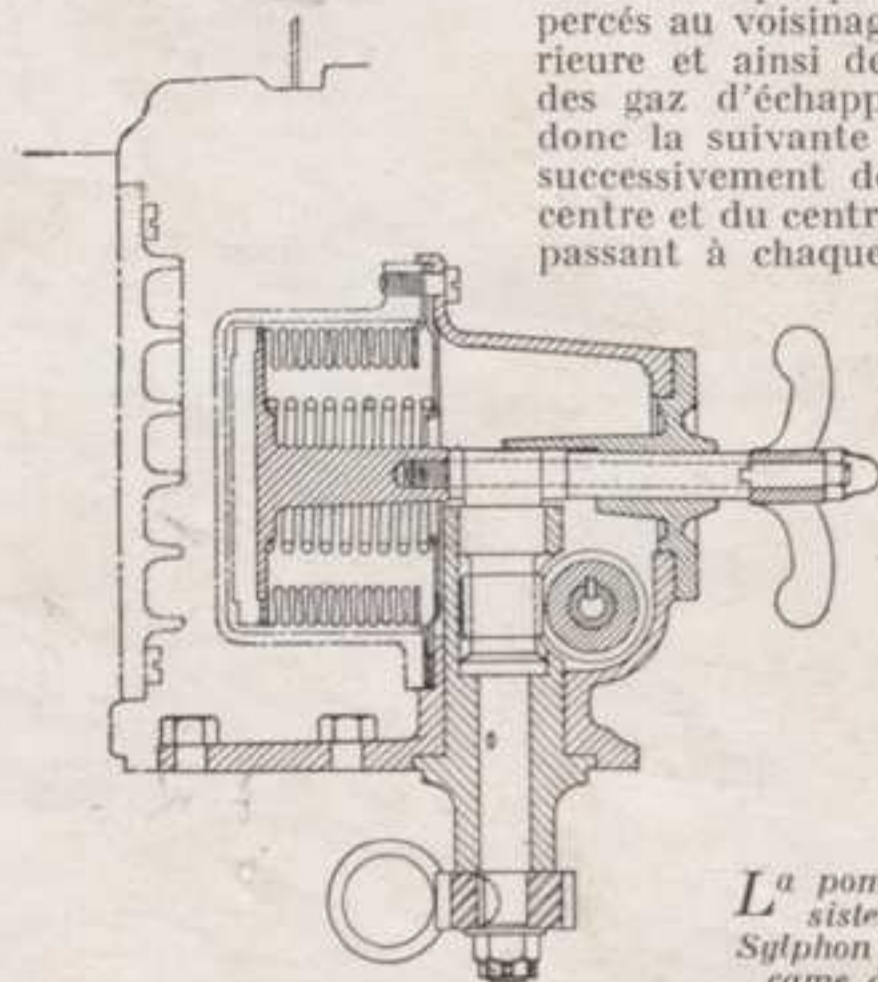
En haut, au centre : La barre d'accouplement est pourvue de deux boulons de serrage, l'un agissant sur la partie filetée, l'autre sur la surface unie de la barre. Ceci est un point de détail, mais il est significatif du soin apporté à l'établissement de tous les organes de la voiture. Cette mesure empêche la rupture de la barre d'accouplement dans la partie filetée.

L'essieu avant présente plusieurs caractéristiques intéressantes. Le système de freins hydrauliques Duesenberg n'utilise qu'un seul piston placé verticalement, ce qui réduit les chances de fuite et empêche que la boue et les poussières n'atteignent le piston en caoutchouc. Aucun réglage n'est nécessaire au talon des sabots de frein, le point d'attaque est si judicieusement choisi que tout réglage est superflu. Par suite, le seul réglage à effectuer est le rattrapage de l'usure de la garniture et les deux sabots sont réglés en même temps comme il est montré. Pour effectuer le réglage, amener le sabot avant en contact avec le tambour sans toucher pour le moment au sabot arrière ; dès que l'on agit pour la première fois sur la pédale de frein, le mécanisme répartit automatiquement le jeu uniformément entre les deux sabots, la liaison compensatrice étant montée sur un pivot libre.

de réduire la pression à la sortie des gaz d'échappement à un minimum négligeable, et après de nombreuses études et de nombreuses expériences, on a créé un pot d'échappement qui donne entière satisfaction. Ce pot a des dimensions véritablement énormes et possède un diamètre de 16  $\frac{1}{2}$  m et une longueur voisine de 1 m. 40.

L'effet de détente est obtenu dans ce pot d'échappement par un refroidissement des gaz d'échappement obtenu en faisant frapper ces gaz fréquemment sur l'enveloppe extérieure du pot d'échappement de telle sorte que la chaleur est rapidement transmise à l'extérieur.

Un tube de by-pass situé au centre du pot d'échappement permet d'éliminer les gaz d'échappement directement sans passer par l'intermédiaire du pot, lorsque le conducteur le désire. Entre le tube central du by-pass et l'enveloppe extérieure du pot, se trouvent de nombreuses chicanes coniques, toutes soudées à l'enveloppe extérieure du pot. Ces chicanes sont disposées de la façon suivante : une chicane est soudée à l'enveloppe extérieure et laisse un passage annulaire aux gaz situés au centre du pot. La chicane suivante, au contraire, est placée au contact du tube du by-pass et porte au contraire à sa périphérie une série de trous percés au voisinage de l'enveloppe extérieure et ainsi de suite. La circulation des gaz d'échappement dans le pot est donc la suivante : les gaz se déplacent successivement de la périphérie vers le centre et du centre vers la périphérie, en passant à chaque fois au travers d'une chicane, soit par l'espace central annulaire, soit dans les trous extérieurs. Les trous percés dans les chicanes au commencement du pot sont relativement grands, ceux qui se trouvent au contraire à la fin sont de plus en plus petits. Le pot



La pompe à essence consiste en un soufflet Sylphon commandé par une came à deux bossages.

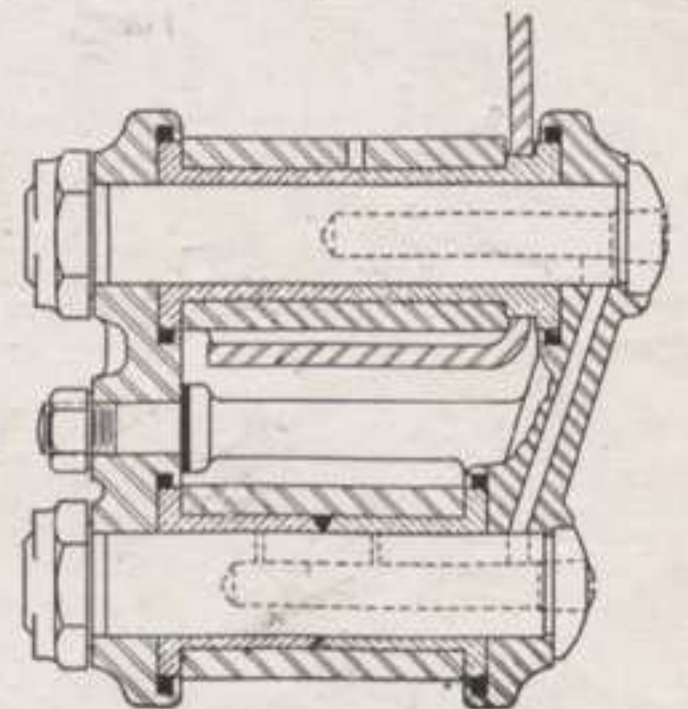
d'échappement se termine par deux tubes de dégagement, l'un de ces tubes assure le fonctionnement du pot, au cas où l'autre tube serait gêné par le déplacement de l'essieu arrière.

Le tube d'échappement double d'un diamètre de 12  $\frac{1}{2}$  m est lié au tube de dégagement terminal par des brides boulonnées au moyen de 12 boulons de 10  $\frac{1}{2}$  m. Ces tubes sont en acier chromé, ainsi d'ailleurs qu'un grand nombre de pièces du châssis.

On utilise pour l'alimentation du moteur un carburateur Duplex Schebler ayant des ouvertures de 3,75  $\frac{1}{2}$  m. Ce carburateur est relié à un double tube d'alimentation en aluminium chromé dont l'une des branches alimente les cylindres 1, 2, 7 et 8 et l'autre branche, les cylindres 3, 4, 5 et 6. Ce tube d'alimentation est réchauffé par deux tubes se déplaçant entre les cylindres 4 et 5 du moteur et regagnant le double tube d'échappement situé de l'autre côté du bloc moteur. Le passage du courant des gaz chauds est contrôlé par un thermostat logé sur le côté droit du bloc cylindre.

Pour fournir la quantité de carburant nécessaire à un moteur de cette dimension quand il tourne à sa pleine vitesse, il est nécessaire d'utiliser un Sylphon muni d'un arbre à cames à 2 butées. Cette pompe à carburant est mue par l'arbre de la génératrice, par suite l'arbre à cames tourne à une vitesse égale au vingtième de la vitesse du moteur, mais comme en réalité cet arbre porte 2 butées, la pompe reçoit une pulsation pour 10 rotations de l'arbre du moteur, et alimente celui-ci en fonction de sa vitesse. Cette pompe est également reliée à un dispositif de réglage qui permet de s'assurer en cours de fonctionnement si le mélange est trop riche ou trop pauvre et de le corriger s'il y a lieu. Le carburant est filtré par un Gascolator placé avant la pompe et monté sur le socle de cette pompe. Le réservoir d'essence a une capacité de 120 litres environ et est alimenté par une ouverture

Pour éviter l'introduction de la boue et de corps étrangers, les douilles des jumelles de ressorts sont pourvues de rondelles de feutre comme le montre la figure, et, pour offrir une grande surface d'appui aux charges latérales, elles sont munies de larges collerettes aux extrémités. La rondelle de cuir en forme de V représentée au centre de la douille inférieure est destinée à empêcher les fuites d'huile.





placée sur le côté de la voiture de telle façon que le remplissage ne soit pas gêné par les malles et les coffrets.

Une des nouveautés les plus caractéristiques de cette voiture est le "Timing-Box" monté près de la pompe d'alimentation et mû par l'arbre de cette pompe. Cet appareil dont le but est très humain a pour effet d'assister le conducteur de la voiture et de le décharger de tous les soins courants d'entretien du moteur. Par exemple, lorsque la voiture a parcouru 1.500 km. environ une lampe s'allume et indique au conducteur qu'il est temps de changer l'huile de graissage contenue dans le moteur. Au bout de 2.200 km. environ, une autre lampe s'allume et indique qu'il est temps de mettre de l'eau dans la batterie d'accumulateurs. Enfin, tous les 120 km. environ, une valve à ressort, montée sur le socle de la pompe d'alimentation, est ouverte, ce qui oblige une certaine quantité d'huile à passer sous pression dans tous les points du châssis qui doivent être lubrifiés, y compris les ressorts, les amortisseurs, etc. Lorsque ce système fonctionne, une lampe rouge est continuellement allumée et de même une lampe verte allumée signale que le réservoir Bijur contient encore de l'huile. Les indications qui ont été données plus haut s'appliquent à une voiture dont la démultiplication est de 3,5. Les distances sont légèrement réduites lorsque la démultiplication de la voiture passe de 3,5 à 4,5.

Le "Timing-Box" est formé de 4 groupes de petits engrenages planétaires placés en série et ayant une démultiplication de 4,8. Le rapport de démultiplication entre l'axe de cette boîte et l'arbre de la pompe d'alimentation est de 16, tandis que le rapport de démultiplication entre l'arbre de la pompe d'alimentation et le vilebrequin est de 20. Il en résulte que la démultiplication totale entre le dernier engrenage de cette boîte et le vilebrequin est, pour une démultiplication de la voiture de 3,5, de :  $20 \times 16 \times 4,8 \times 4,8 \times 4,8 \times 4,8$ . Dans ces conditions, le "Timing-Box" agit sur la circulation de l'huile tous les 120 km. environ.

Le système de graissage du moteur a naturellement été étudié avec le plus grand soin et toutes les parties importantes du moteur sont lubrifiées sous pression, particulièrement les coussinets, les têtes de bielles, les arbres à cames, etc.

L'huile est filtrée deux fois, une fois avant d'entrer dans la pompe à engrenage située à la base du vilebrequin et une seconde fois dans un Purolator, après avoir quitté cette pompe. A côté de ces précautions, les mannetons du vilebrequin contiennent des petits emplacements dans lesquels se trouvent emprisonnées, sous l'influence de la force centrifuge, les impuretés qui viennent se loger dans ces emplacements.

La moitié inférieure du carter est en fonte d'aluminium ayant subi un traitement thermique, et elle est creusée de rainures profondes à la fois sur la partie interne et sur la partie externe, rainures qui servent à dissiper plus facilement la chaleur emmagasinée par l'huile.

Les arbres à cames sont creux, afin de permettre le passage de

l'huile jusqu'aux 5 tourillons, d'où l'huile passe dans un conduit courant sur toute la longueur de l'arbre, de telle sorte que les cames et les butées des tiges de soupapes sont continuellement plongées dans un bain d'huile. Le dispositif permettant le réglage de la pression de l'huile, ainsi que l'indicateur de niveau de l'huile, sont situés dans un endroit accessible sur le côté droit du moteur. Le châssis comporte également un système de ventilation du carter constitué par un tube que l'on ne peut voir, qui relie un point situé près de la

pompe d'alimentation à un autre point situé près du carburateur où il entre dans le carter par l'intermédiaire de deux ouvertures de ventilation.

Le système de refroidissement a une capacité totale de 30 litres. Le radiateur, du type nid d'abeilles, est constitué par une série de tubes de cuivre pur, et forme à l'avant et au centre de la voiture un angle très faible. La pompe centrifuge assurant le déplacement du courant d'eau de refroidissement est mue par une chaîne qui commande l'arbre de cette pompe et qui est placée sur le côté gauche du moteur. On a disposé un contrôle thermostatique de l'eau sur la partie supérieure du radiateur.

Le démarrage se fait au moyen d'un démarreur Delco-Rémy, spécialement construit pour le moteur et qui est commandé par un bouton placé sur le tableau de bord par l'intermédiaire d'un engrenage Bendix. La génératrice Delco-Rémy est du type usuel, mais a été néanmoins prévue pour fournir un courant suffisant même aux faibles régimes du moteur. Le distributeur du courant aux bougies est du type à double came et est monté sur la partie supérieure centrale du moteur. Sa commande se fait par l'arbre des cames d'admission

par l'intermédiaire d'un engrenage conique. Une batterie d'accumulateurs Exide de 21 plaques et d'une capacité de 160 heures, placée à l'intérieur d'une boîte spécialement conçue sous le pare-boue droit, complète l'équipement électrique du moteur.

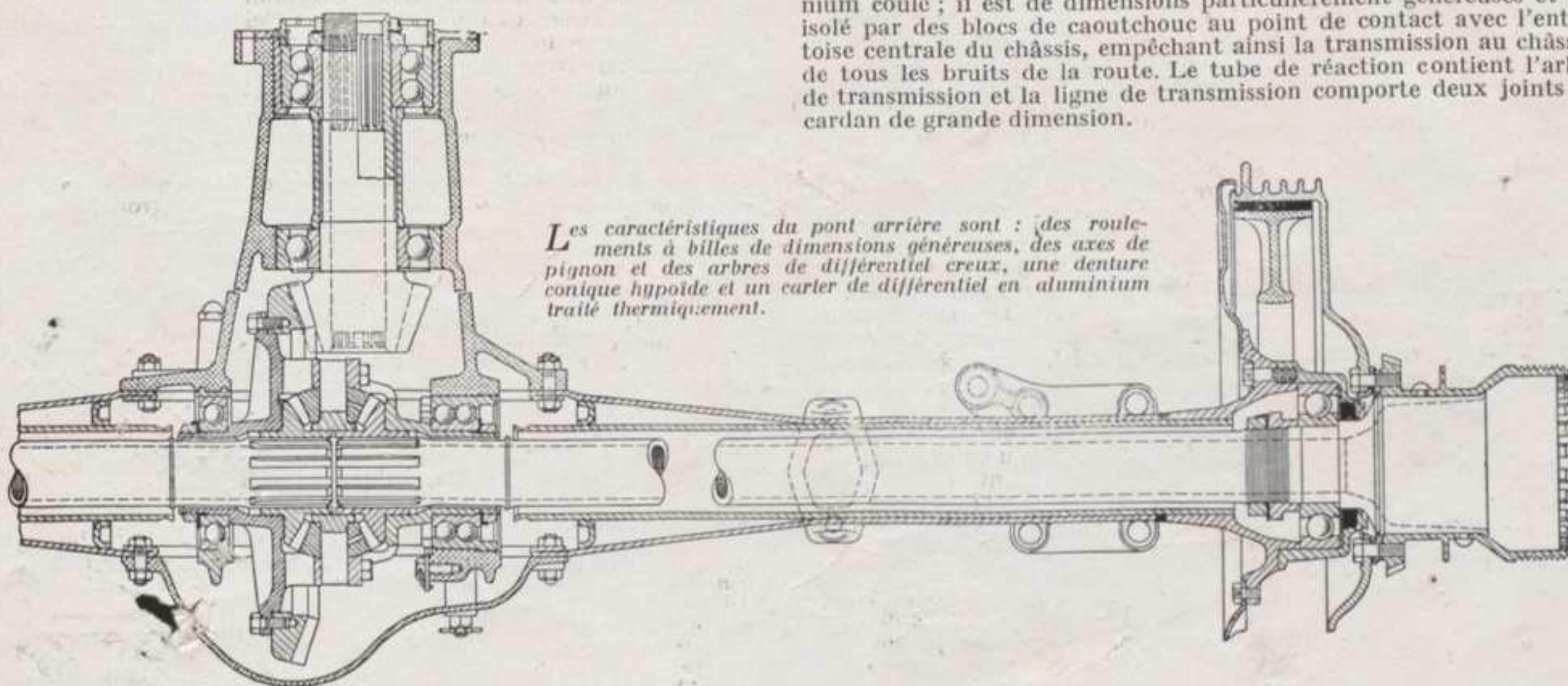
Pour mettre en marche un moteur d'une telle puissance, on utilise lorsque besoin en est, une manivelle Long du type à 2 plateaux et munie d'un nouveau ressort d'amortissement.

La boîte de transmission à 3 vitesses est particulièrement intéressante, car elle est munie d'un train d'engrenage intermédiaire silencieux. Le montage des engrenages correspondant à la deuxième vitesse est particulièrement soigné, de telle sorte qu'il est possible de passer de la deuxième vitesse à la troisième et inversement de la troisième vitesse à la seconde dans des conditions de facilité exceptionnelles. Tous les engrenages de la boîte de transmission sont en acier spécial ayant subi un traitement thermique et la boîte proprement dite est en alliage d'aluminium spécial ayant également subi un traitement thermique.

Le cardan arrière est du type métal sur métal et est graissé automatiquement par le système Bijur, alors que le cardan avant est du type à rotule et comprend huit grosses balles ovales en caoutchouc de composition et type spéciaux ; il n'exige aucun graissage et est surtout destiné à compenser les faibles erreurs d'alignement. L'arbre de transmission est tubulaire et de grand diamètre. Le tube de réaction est de type spécial et comprend un étrier en aluminium coulé ; il est de dimensions particulièrement généreuses et est isolé par des blocs de caoutchouc au point de contact avec l'entretoise centrale du châssis, empêchant ainsi la transmission au châssis, de tous les bruits de la route. Le tube de réaction contient l'arbre de transmission et la ligne de transmission comporte deux joints de cardan de grande dimension.



Un joint de cardan Spicer comportant huit balles de caoutchouc est employé à l'extrémité avant de l'arbre de transmission.



Les caractéristiques du pont arrière sont : des roulements à billes de dimensions généreuses, des axes de pignon et des arbres de différentiel creux, une denture conique hypoidée et un carter de différentiel en aluminium traité thermiquement.



Le pignon et la couronne dentée du différentiel sont à denture hypoïde de façon à abaisser le centre de gravité. Les roulements à billes employés sont de dimensions généreuses. Un roulement n° 31 absorbe uniquement la charge radiale du pignon alors qu'une butée à double effet n° 310 a été prévue à l'extrémité avant du pignon. L'arbre du pignon est creux, d'un diamètre presque double de celui généralement employé, et est muni de cannelures à l'intérieur. La cage du différentiel est une pièce de fonderie en duraluminium.

Le pont arrière est du type semi-oscillant et comporte des arbres de différentiel creux de 55,5 mm; l'adoption d'arbres creux, non seulement réduit le poids, mais permet l'emploi d'arbres de plus grand diamètre sur lesquels on peut usiner un nombre plus grand de cannelures plus grandes. Les arbres sont en alliage d'acier à haute résistance, sont usinés extérieurement et intérieurement, et sont enfermés dans un carter spécial, type "banjo", en acier embouti. Ces arbres sont portés par des roulements annulaires n° 311 aux extrémités extérieures et des roulements simples et doubles n° 212 à l'intérieur. Les fusées de roues sont estampées, usinées pour les alléger et pèsent la moitié seulement environ du poids de celles employées sur les grosses voitures de type courant. Une caractéristique importante dans la construction du pont arrière et des roues est l'emploi de roulements annulaires à billes de dimensions exceptionnelles. Les deux paliers qui portent l'arbre du pignon d'attaque sont montés à une grande distance l'un de l'autre de façon à assurer le maximum de rigidité, et il en est de même pour les roulements des roues avant et arrière. Le pignon est réglé à l'aide de cales, mais sans intention de modifier ce réglage après que la voiture est sortie des ateliers, alors que la couronne de différentiel est réglée au moyen d'un manchon fileté d'un côté, le roulement à billes de l'autre côté étant mobile sur l'arbre.

L'essieu avant est constitué par une poutre de section en I obtenue par estampage et est muni d'extrémités type Elliott renversé. Les pivots sont portés presque au centre de la roue et les fusées sont de diamètre exceptionnellement grand. Un roulement à billes n° 405 à l'extérieur de la fusée absorbe les charges latérales alors qu'un roulement n° 309 disposé à l'intérieur supporte la presque totalité des charges radiales, car il se trouve dans le plan central de la roue. Le carrossage donné à l'essieu avant Duesenberg est de 1°, alors que la chasse est de 2° 1/2. Le pincement des roues vers l'avant est d'environ 3,20 mm de chaque côté.

La nouvelle voiture comporte une direction Ross spéciale à came et levier, de rapport 18 à 1. Chaque organe de la direction est surdimensionné pour assurer une large marge de sécurité aux grandes vitesses. Le volant est de grand diamètre avec une couronne mince et seulement trois rayons. Le but de la réduction du nombre de rayons est de faciliter l'observation des instruments montés sur le panneau devant le conducteur.

Les freins sont du type familier Duesenberg, hydrauliques à piston intérieur. Des améliorations ont été apportées au système de freinage de la nouvelle voiture en augmentant notablement les rapports des bras de levier et la dimension des ailettes de refroidissement des tambours.

Les tambours de frein sont en acier forgé, de 381 mm de diamètre et 76 mm de largeur, entièrement entourés d'ailettes de refroidissement. Deux sabots de frein en aluminium fondu viennent porter contre le tambour; ils sont montés de façon qu'un seul réglage permette de rattraper l'usure des deux garnitures.

Le tambour de frein de secours a 203 mm de diamètre et 76 mm de largeur: il est monté sur l'arbre moteur immédiatement derrière la boîte de vitesse et est actionné par un levier à main de construction et apparence exceptionnellement robustes et massives, placé à côté du conducteur.

Les ressorts sont longs et larges, leurs surfaces sont unies et polies. Les ressorts avant ont 1.041 mm de longueur et 63,4 mm de largeur, alors que les ressorts arrière ont 1.575 mm de longueur et 63,4 mm de largeur. Les ressorts avant et arrière sont articulés avec interposition de larges douilles en bronze protégées par des enveloppes spéciales empêchant l'introduction de l'eau et de la boue, et retenant l'huile envoyée par le système automatique de graissage central. Les deux ressorts sont enfermés dans des gaines étanches à l'huile et à la boue et la poussière de la route. Un amortisseur Lovejoy à double effet est monté sur le châssis en chacun des quatre points de suspension.

Six roues de 482,5 mm avec jantes et pneus de 152,3 mm sont livrées avec chaque châssis. Elles sont de construction particulièrement robuste avec un nombre de rayons très élevé pour assurer une résistance formidable. Les roues à rayons et jante chromées constituent l'équipement standard de tous les châssis, à moins qu'il en soit spécifié autrement par le client.

Le châssis de la nouvelle voiture constitue probablement sa caractéristique la plus intéressante. Les longerons emboutis, en tôle d'acier de 5,56 mm d'épaisseur, ont 216 mm de hauteur au centre avec

des ailes de 70 mm. Six entretoises tubulaires les relient ensemble la plus grande a 101,5 mm de côté et la plus petite 57 mm de diamètre. L'entretoise de section carrée de 101,5 mm de côté est rivée et soudée à l'autogène dans le châssis avec des goussets doubles de 216 x 305 mm.

La seconde traverse à partir de l'avant du châssis est de section carrée et a 57 mm de côté; elle est incurvée vers le bas et supporte le radiateur. Une pièce de section circulaire, en alliage d'acier coulé traité thermiquement, de 51 mm de diamètre, s'étend vers l'avant du point d'attache de chaque jumelle arrière des ressorts avant jusqu'à la seconde traverse en un point distant de 152 mm des longerons. L'avant du moteur repose au centre de ces pièces de fonderie de 610 mm.

Ce type de construction en "A" constitue en réalité une entretoise de 610 mm de largeur dont le bord arrière passe théoriquement par le centre du moteur. Deux pièces de forge ayant la forme d'augets sont rivetées et soudées à l'autogène sur les longerons de chaque côté en arrière de cette traverse pour recevoir les supports arrière du moteur qui reposent sur des blocs en caoutchouc en forme de cuvette.

La construction de la partie avant du châssis a fait l'objet de soins tout particuliers, M. Duesenberg étant d'avis que le shimmy et le flottement des roues sont dus pour une grande part, à la déformation du châssis. L'arrière est pourvu d'un double relèvement facilitant au carrossier la disposition des sièges.

L'une des plus jolies choses de la voiture est la planche à instruments. La surface est en cuivre et est finie avec une bande chromée oxydée, bouchonnée au moteur. Tous les instruments ont des cadrans noirs avec aiguilles ou index et chiffres blancs, combinaison que M. Duesenberg estime faciliter le mieux la lecture. Parmi les instruments montés sur la planche se trouvent un indicateur de vitesse allant jusqu'à 150 milles par heure (240 km/h.), un compte-tours allant jusqu'à 5.000 tours minute, un thermomètre pour la température de l'eau de refroidissement, un manomètre de pression des freins, un ampèremètre, un indicateur de niveau d'essence, un altimètre, le bouton du démarreur, la commande du diffuseur du carburateur, un verrouillage de l'allumage du moteur et des petites lampes de signalisation pour la pression d'huile et l'état de la batterie d'accumulateurs.

Le volant est placé sous un angle tel qu'il est presque parallèle à la planche à instruments. Il est émaillé noir avec au centre, les commandes en noir et argent. Ces commandes diffèrent aussi sensiblement de la pratique courante, car elles prennent la forme de boutons-poussoirs, plutôt que de manettes. Il faut placer dans ce groupe les commandes manuelles des gaz et de l'avance à l'allumage ainsi que les commutateurs d'éclairage.

Le tablier constitue aussi une caractéristique particulière à cette voiture. Il est en aluminium traité thermiquement et les supports de la planche inclinée sous les pédales sont venus directement de fonderie. Deux pièces de fonderie creuses, ovales, en aluminium sont fixées à l'arrière du tablier pour supporter la planche à instruments. Ces pièces de fonderie ont environ 380 mm de longueur et, en sus de leur fonction en tant que support de la planche à instruments, elles contiennent tous les fils et câbles aboutissant auxdits instruments, de sorte que la planche à instruments est fixée de façon rigide sur le châssis et est indépendante de la carrosserie; de plus tous les conducteurs électriques sont visibles et facilement accessibles.

Les phares avant et les feux de stationnement sont de modèle spécial et s'harmonisent avec la ligne de la voiture. Une combinaison de feu arrière, stop et signalisation, est comprise dans l'équipement. Les marchepieds sont courts et en noyer. Ils portent dans le sens de la longueur des bandes chromées qui se prolongent sur le garde-boue arrière presque jusqu'à son sommet.

Ainsi qu'il résulte de la description, il est fait, dans cette voiture, usage d'un nombre inusité de pièces en aluminium traité thermiquement et de pièces chromées. Les organes suivants sont en aluminium traité: tablier, planche à instruments, supports de la planche à instruments, supports du tube de direction, support de feux arrière, carter du différentiel, étrier et couvercle du tube de réaction, consoles diverses, carter du volant du moteur, puisard d'huile du moteur, couvercles des carters de chaîne du moteur, couvercle d'arbres à cames, couvercles des chemises d'eau du moteur, corps de la pompe à eau, collecteur d'admission, couvercles des tambours de frein des essieux avant et arrière, sabots des freins hydrauliques et de secours, support de roues de rechange, corps de l'orifice de remplissage du réservoir d'essence, et carter de la pompe à essence.

Les parties suivantes sont chromées: radiateur, roues et chapeaux de moyeu, phares avant, supports et consoles diverses, barre d'accouplement, lampes de ville, feu arrière, parties du tablier, amortisseurs, supports de capot, filtre à huile, arbre de commande la génératrice, ceinture de la génératrice, tous les boulons et écrous extérieurs du moteur, bouchon du réservoir d'essence, biseaux et filets de la planche à instruments, traverse du radiateur.





# Servicing the 1932 Auburn Twelve Cylinder Engine

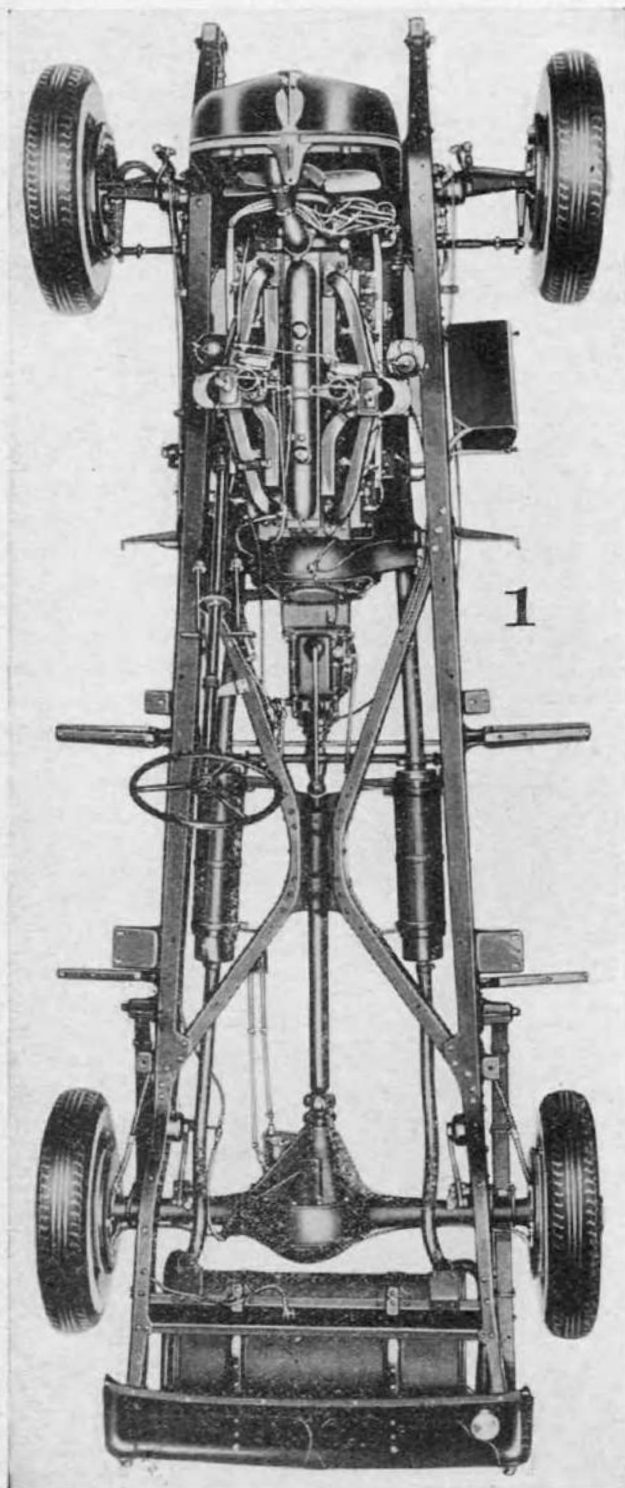


Fig. 1. Plan view of Auburn twelve-cylinder,  
dual ratio rear-axle car

**Tolerances, Clearances and Specifications, Including the Recommended Service Routine on a New Twelve Cylinder Engine. Complete in This Issue with Wiring Diagrams**

**By C. T. SCHAEFER**

Member S. A. E. and A. S. M. E.  
Author of "The Automotive Mechanic's Handbook"

THE Auburn Model 12-160 introduced to the public early this year is powered by a Lycoming engine designated as Model "BB." This engine is an entirely new design and has many features not previously employed on vertical engines. This engine is a compact, accessible 45-degree V-type, with cylinder blocks and crankcase cast integrally. The narrow angle of the V reduces the overall width of the engine and the V-type unit also makes possible a comparatively short engine for the large piston displacement. In effect this unit is really two six-cylinder engines operating on the same crankshaft, the firing order of each bank of cylinders being 1-5-3-6-2-4.

## Details of Construction

Constructional details of this engine are presented in the longitudinal cross section Fig. 3, and the cross section, Fig. 4. The cylinder head of each block is detachable, but provided with covers which contain the spark plugs. The 45-degree angle between the two banks of cylinders results in uneven firing, breaking up the regularity of the power impulses. It is claimed this irregularity is not detrimental to smoothness, but does reduce the tendency to set up torsional vibration in the crankshaft. The location of the camshaft in the center of the V with rocker shaft directly above permits operation of both banks of horizontal valves from a single camshaft. The rocker shaft and camshaft supports tie the two banks of cylinders together.

The crankshaft is mounted on four main bearings and provided with three counterweights, one weight serving each pair of crank pins. The crankshaft is also equipped with a vibration damper mounted at the front end. Exceptional rigidity of the shaft is obtained by large diameter bearings and the comparatively short throw of the shaft. Internal clearance for the reciprocating parts also provides for the re-



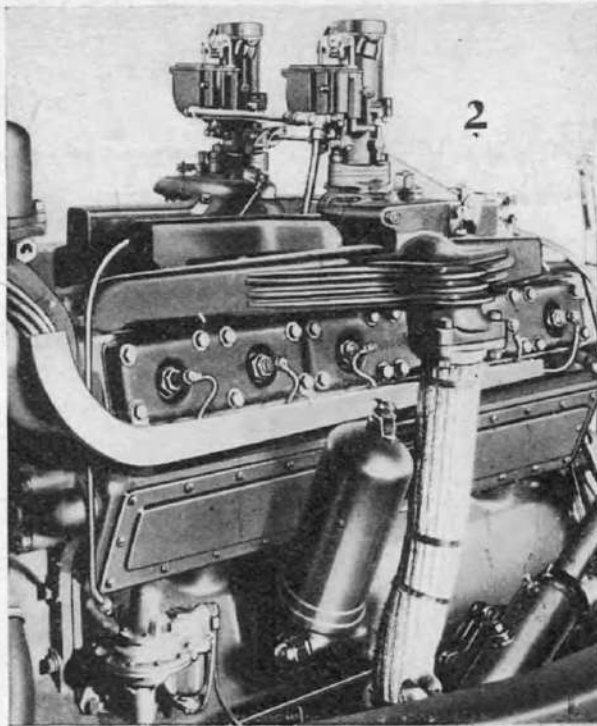


Fig. 2. View of twelve-cylinder Lycoming engine

removal of piston and connecting rod assemblies from the bottom of the engine.

An entirely original combustion chamber design has been developed having characteristics which result in increased power and efficiency without detonation, as well as better accessibility. The compression ratio is fairly high, but permits the use of commercially standard fuel. Cylinder head covers which are in pairs, containing the spark plugs, may be removed to regrind the valves without removing the cylinder head from the block. The cylinder heads may be removed without disturbing either the camshaft or rocker arm assembly. While each bank of cylinders has its individual head, the two heads are identical.

It will be noted the valves are mounted in the cylinder head, valve adjustment being accomplished by removing the cover which encloses the valve mechanism. Each bank of cylinders has its individual intake and exhaust manifold. The intake manifold is of Swan design, designed for the downdraft carburetor. The exhaust manifold has a hot spot which applies heat under the center of the intake manifold runner. The fuel pump is a plunger type with double outlet to accommodate the two carburetors. It is driven by an eccentric on the oil pump shaft and mounted on a pad at the left front side of the crankcase. The pump is

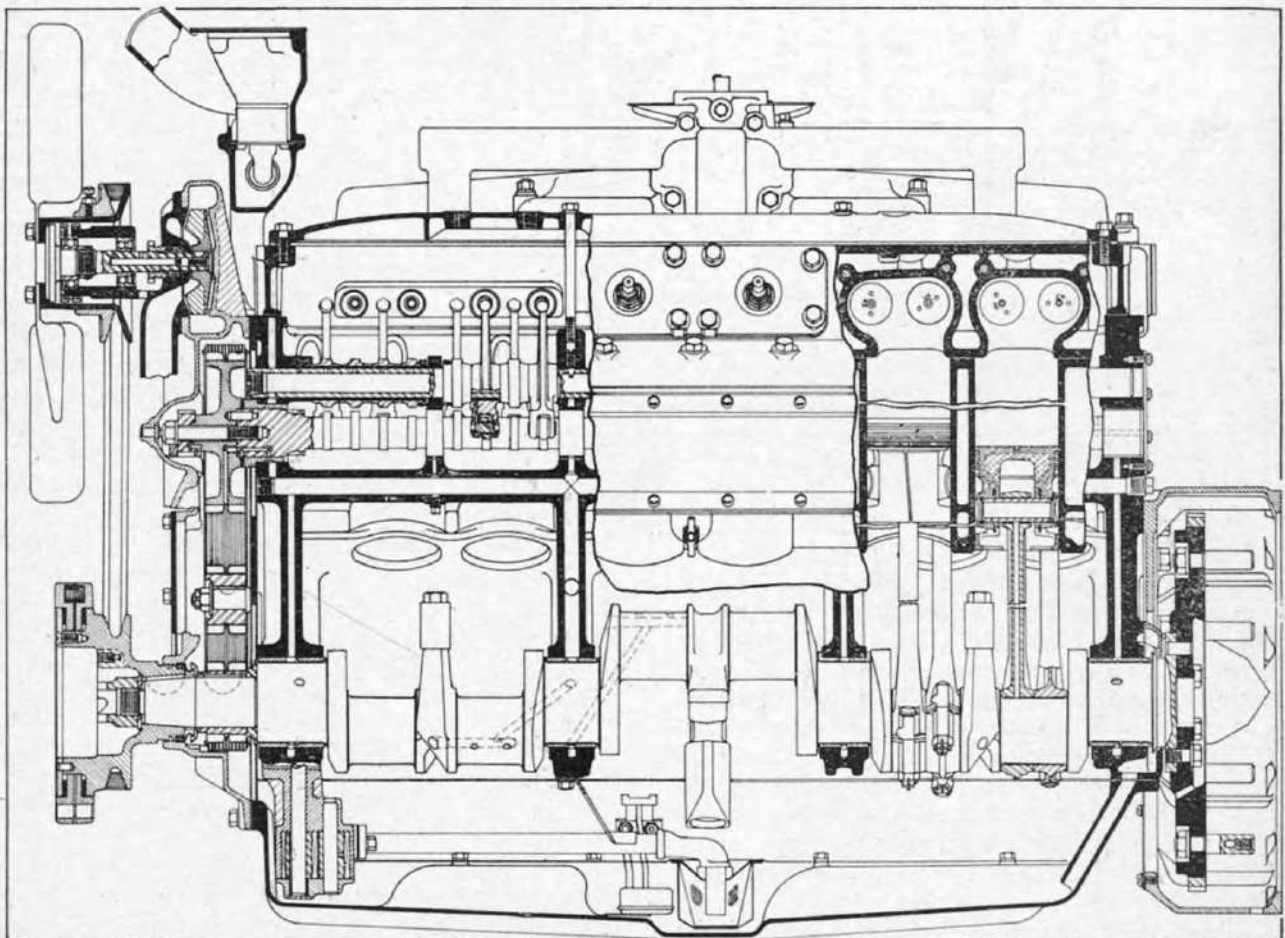


Fig. 3. Longitudinal cross section view of the Lycoming model "BB" twelve-cylinder engine, as employed in the Auburn chassis



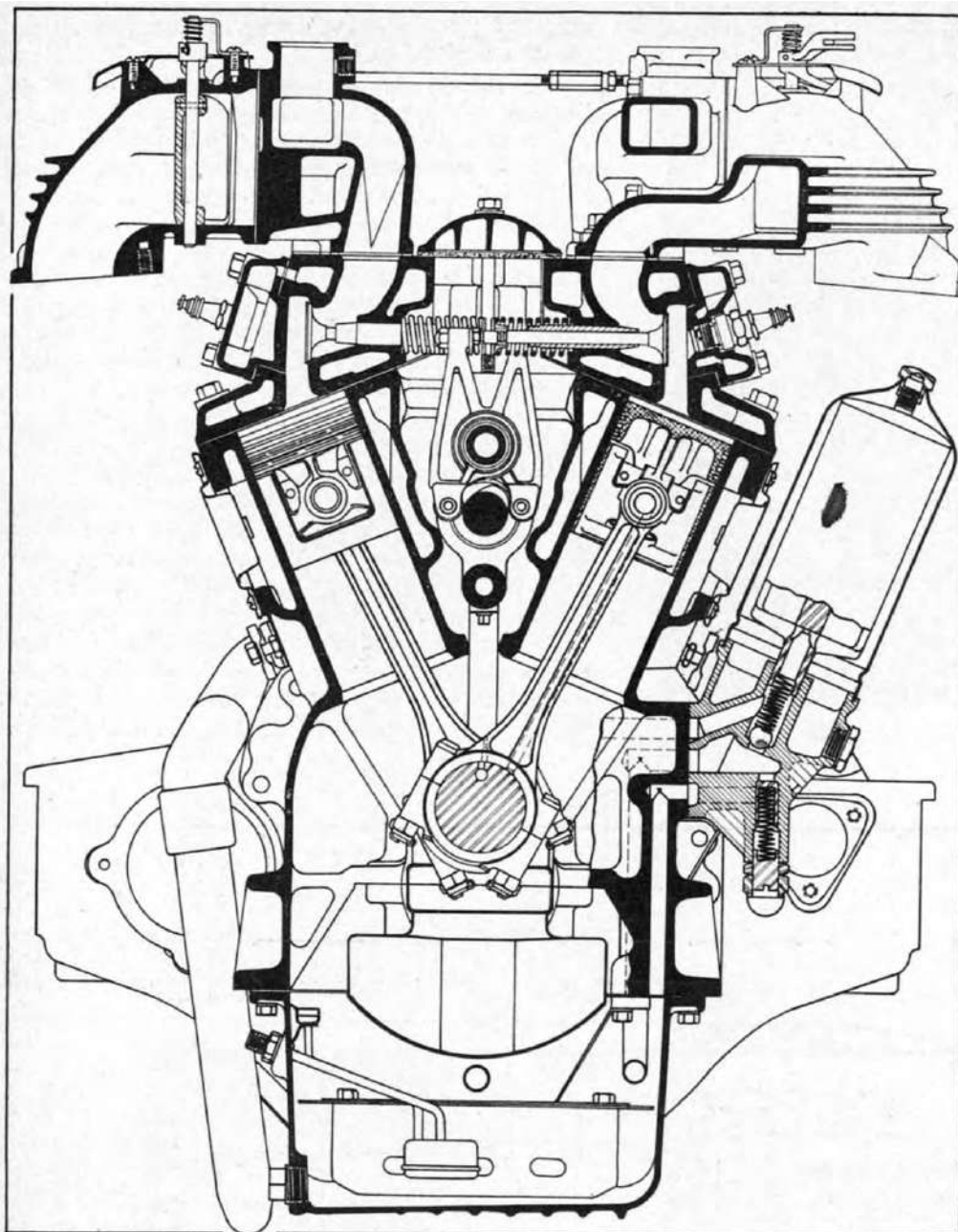


Fig. 4. Cross section of the engine showing pistons, connecting rods and valve mechanism

located in the fan blast to reduce the possibility of vapor lock.

#### Engine Lubrication

The oil pump is a gear type, driven from a helical gear on the camshaft directly behind the front bearing of this shaft as shown in Fig. 3. The oil enters the pump through a large strainer and pipe lead from the center of the crankcase as shown in Fig. 3, and is pumped into the full-flow filter as shown in Fig. 4. The oil filter also contains the oil pressure relief valve which is provided with an external adjustment. The filter also contains a by-pass valve which permits the oil to go directly from the pump to the main oil line in the event the oil filter becomes clogged through neglect to keep it clean.

The main oil line from the pump is a longitudinally drilled passage just beneath the camshaft which sup-

plies oil under pressure to the main bearings, camshaft bearings, rocker shaft tube and oil pump drive shaft bearings. The crankshaft is drilled to feed oil to the connecting rod bearings. Oil is forced intermittently to the piston pin bearings through rifle drilled connecting rods. Oil jets drilled in the rod also provide a properly timed spray of oil to the cylinder walls. From the front camshaft bearing drilled passages through the shaft and sprocket lead out to feed oil on the inside of the front end chain. Oil from the hollow rocker shaft is fed out into the valve rocker bearing. The rocker arm is also drilled to provide oil under pressure to the valve tappet rollers. The spray from the camshaft and rocker bearings lubricates the valve stems and the complete valve mechanism.

The distributor is driven through helical gears at the front end of the camshaft, a sectional view of this



drive being shown in Fig. 6. An adjustable coupling is provided on the driveshaft at the base of the distributor. Distributor rotation is clockwise when viewed from top. The automatic spark advance starts at 600 rpm. and is 20 degrees maximum at 3200 rpm. Two breakers are used, the fixed breaker operating the right bank of cylinders.

### Pistons, Pins and Rings

Pistons are of the strut type, aluminum alloy and should be assembled to the cylinder with sufficient clearance so that a .0015-in. feeler is easily pulled out, while a feeler .0025-in. cannot be withdrawn. Feelers should be gripped with forefinger and thumb and pistons should not be so tightly fitted that the smaller feeler can be pulled by gripping feeler with pliers. Pistons and connecting rods are balanced or weighed in sets to close tolerances to insure proper balance of reciprocating parts and it is necessary to maintain this balance when making replacements.

The piston pin has a floating mounting in both piston and rod and is retained in the piston by means of snap rings. The pin should be fitted to a clearance of .0006-in. Pistons should be heated to 160 to 180 degrees in order to remove and refit pins. Pins must have a drive fit. This is important as expansion of the piston under operating conditions would permit a knock to take place should these tolerances be disregarded. Always check piston pin bearings for alignment when making replacements.

The aluminum alloy pistons are provided with four rings, two of which are compression rings,  $\frac{1}{8}$ -in. wide. These compression rings should be fitted with .001-in. to .002-in. clearance in the piston groove. When fitting of rings is necessary, the upper side of the ring only should be dressed as the lower side must have a perfectly square seat on the groove surface. It is difficult to maintain this true seat when lapping is done on the under side of the ring. The gap in the compression rings should not be less than .006-in. The oil regulating rings are  $\frac{1}{8}$ -in. and  $\frac{3}{16}$ -in. wide respectively and these rings should have a clearance of .0015-in. to .003-in. in their respective grooves. The gap in the oil regulating rings may be slightly greater specifications calling for .010-in. to .018-in.

### Bearings

The connecting rod bearings are babbitt spun in the rod and no adjustment is provided or permissible

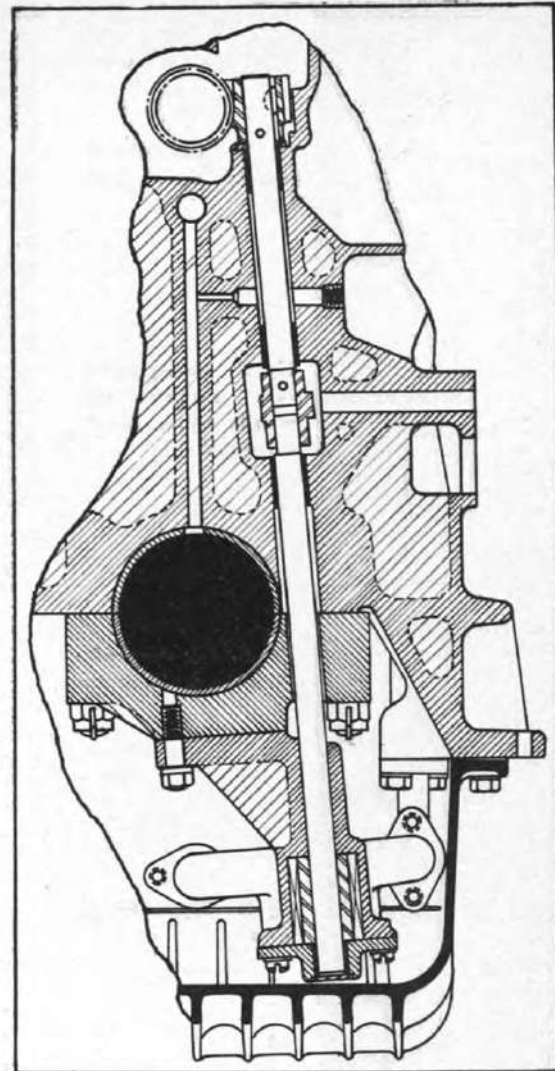


Fig. 5. Sectional view showing how oil pump is driven by helical gears from the crankshaft

as rods are supplied on an exchange basis and any fitting that may be done would prevent maintaining the original factory standards in replacement since exchange rods are rebabbitted. The end clearance specified is to exist between the two rods on each crankpin. Rods are numbered and must be replaced in their original cylinders which bear corresponding numbers.

(Continued on page 43)

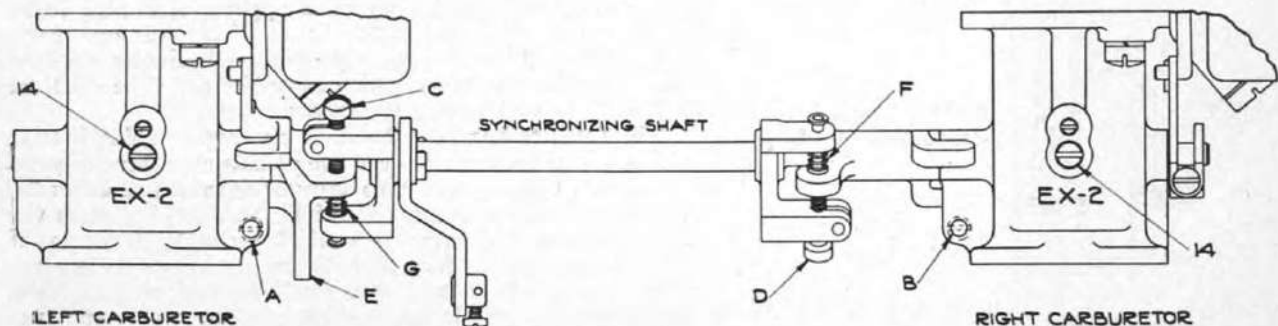


Fig. 7. Diagram showing hook-up employed to synchronize the throttles of the two carburetors employed on this twelve-cylinder engine



## AUBURN 8-100 TOLERANCES

(Continued from page 40)

17. Cooling system, pump circulation, cellular type radiator; capacity, 19 qts. Upper hose connection, 1½" diam., length, 9"; lower hose connection, 1½" diam., length 11". Fan belt, 38° Vee, endless, width ¾"; approximate length, 46".
18. Front wheel toe-in, ⅛" plus ⅓" minus 0"; front wheel camber, 2°; caster angle, 1° min., 2° max.; king pin angle, 7°.
19. Clutch, Long model 9ABM; clutch facing, outside diam., 10", inside diam., 5½"; thickness, .137", moulded type, two required.
20. Rear axle gear and pinion clearance (back lash), .003 to .008".
21. Brakes, Midland Steeldraulic, internal expanding; clearance between lining and drum for front and rear wheels, heel and toe, .040". Brake lining length per wheel, 33¾"; width, 1¾"; thickness, ⅜", moulded type. Division of brake effort, 50 per cent front and 50 per cent rear.
22. Hand brake. Same as foot brakes.
23. Tire size, 17 by 5.50, 17 by 6.00, and 17 by 6.50.
24. Tire pressure, front and rear, 35 lbs.
25. Oil capacity of transmission, 3 lbs.
26. Oil capacity of rear axle, 4 lbs.
27. Standard rear axle ratio, 4.7 to 1.
28. Gasoline tank capacity, 25 gals.

## AUBURN 12-160 TOLERANCES

(Continued from page 39)

19. Clutch, Long model, 29AM; clutch facing outside diam., 9¾", inside diam., 6¼", thickness .130"; type, molded, four required.
20. Rear axle gear and pinion clearance (back lash), .003 to .008".
21. Brakes, Bendix two-shoe, single anchor type, hydraulic actuated; clearance between lining and drum, front and rear wheels, heel and toe, .010". Brake lining length per wheel, 29.321"; width, 2"; thickness, ⅜", moulded type. Division of brake effort, 50% front and 50% rear.
22. Hand brake, same as service brakes.
23. Tire size, 17 by 6.00, 17 by 6.50, and 17 by 7.00.
24. Tire pressure, front and rear, 38 lbs.
25. Oil capacity of transmission, 3 qts.
26. Oil capacity of rear axle, single ratio, 4 qts; dual ratio, 7 qts.
27. Standard axle ratio, single ratio, 4½ to 1; dual ratio, low, 4.55 to 1, high, 3.04 to 1.
28. Gasoline tank capacity, 25 gals.

## TROUBLE HUNTING

(Continued from page 21)

Hoping this may be of some help to readers of the DIGEST, I remain.—CHAS. RICHARDSON, Prop., Cammer Motor Co., Cammer, Ky.

### Misplaced Oil

DEAR EDITOR:

I am writing in regards to the Chevrolet Six burning distributor points. Have had the same trouble with one. I installed three pair of points, including condensers, battery ground cables, grounded distributor and checked wiring, but the same trouble occurred again.

I noticed every time I installed points there was considerable oil on them and distributor. So I turned a spiral groove on distributor shaft and squeezed the oil out of the felt under distributor rotor, put a dab of grease on cam. This car has run 15,000 miles and points are in good condition, and no oil on distributor.

Have also cured other cars from having point trouble by keeping oil out of distributor.—M. HAUENSTEIN, Hinsdale, Ill.

### Ground the Distributor

DEAR TROUBLE MAN:

In answer to Chester Brewer's trouble with points on a 1929 Chevrolet.

I have had the same trouble and I cured it by grounding the distributor. Run a wire from the little screw on the opposite side of the distributor from where the switch comes in to the motor. I am sure that will cure your distributor point trouble. If not, try changing the complete switch.—EUGENE MYERS, Myers Bros., Oil City, Pa.

## SERVICING THE AUBURN 12

(Continued from page 17)

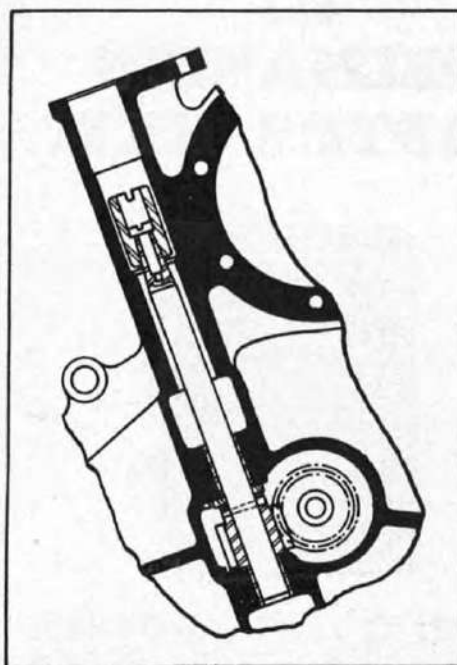


Fig. 6. Sectional view of the distributor drive

The main bearings are of the bronze back interchangeable type and not provided with sims, hence no adjustment is permissible. Bearings are supplied in under size standards for replacement purposes when reconditioning of the crankshaft is necessary. The lower half of the bearing is dowelled to the bearing cap, the upper half being provided with the oil hole through which oil is fed to the bearing from the main oil line in the crankcase. Main bearings have continuous oil grooves to provide a constant feed of lubricant to the connecting rod bearings. End thrust is taken on flanges formed integral with the upper half of the rear center main bearing. No adjustment for end thrust is provided and when this becomes excessive, this part of the bearing should be replaced.

### Valve Mechanism

The camshaft is supported by seven steel back, babbitt lined bushings. Clearance between the shaft and its bushings should be .0015-in. to .003-in. The rocker shaft is 1⅛-in. in diameter and the rocker arm has a steel back, babbitt lined bushing. The roller in the rocker arm which contacts with the cam on the camshaft is bronze bushed and runs on a hardened pin. This roller is 13/16-in. in diameter and 7/16-in. wide and must be concentric and have a true bearing on the cam as flat spots or eccentricity would result in valve noise.

The valve guides are pressed into the cylinder head and in making replacements it is necessary to check end of guide in relation to valve seat and position the replacement guide accordingly. Valves may be reground by removing the inspection cover plate at the center of the engine directly over the valve stems which will give access to remove the springs. Remov-



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ing the cylinder head covers which are in pairs will give access to head of the valve and permit reconditioning valves without disturbing other parts of the engine. Both valves have a thirty degree seat which necessitates the use of 15 degree and 70 or 75 degree cutters when seat reconditioning is necessary. The adjusting screw for adjusting valve stem clearance is located in the end of the rocker arm and the adjustment should be such as to provide .010-in. clearance at the end of the valve stem.

The rocker shaft is a continuous shaft running the full length of the engine and is prevented from rotating by dowel or cone-pointed set screws which are threaded into the same holes into which the bolts holding the center inspection plate enter. Rocker arms are positioned on this shaft to alternately operate the valves of opposite cylinders. Springs are used as spacers between the shaft supports to space the rocker arms.

The front end drive is by means of a silent chain which also drives the generator. The sprocket ratio is such as to drive the generator at 1.19 times crankshaft speed. This chain is manually adjusted by means of a three-bolt flange on the generator.

### Engine Cooling System

The cooling system includes a centrifugal type pump having a double outlet. The pump is belt driven from the crankshaft, the drive pulley also supporting the vibration damper. The pump is mounted on the front of the engine in such position that the shaft extending through the front end of the pump carries the fan. This shaft is mounted on ball bearings, the construction employed being depicted in Fig. 3. The two outlets from the pump lead respectively to the right and left banks of the cylinder block. As water enters the front of the block it is carried through a distributing chamber and discharged evenly throughout the length of the block. The fan belt adjustment is incorporated in the fan pulley which is made in two parts, locked with a set screw. To adjust fan belt loosen set screw and then screw the fan pulley adjusting flange on hub which will reduce the width of the belt groove and force out the belt in the groove, thus taking up the excessive slack and establishing proper tension in the belt.

### Carburetor

The carburetors which are of the down draft type are of Stromberg make and designated as Model Ex-2." This is a single barrel instrument, a carburetor being mounted on each bank of cylinder. In order to obtain steady idling, smooth acceleration and satisfactory all-round performance, both throttle valve openings must be exactly the same. To accomplish this, a synchronizing shaft connects the throttle stem of the left carburetor to the throttle stem of the right carburetor. This shaft has ball joints at both ends to compensate for possible variations caused by heat and misalignment.

The throttle stem of the left carburetor is rigidly pinned to throttle lever E, Fig. 7, and is operated by the accelerating rod, which in turn operates the throttle on the right carburetor by means of the synchronizing shaft. By means of springs F and G and adjusting screws C and D on the shaft, the throttle stem of



the right carburetor must be adjusted to open exactly the same as the throttle stem of the left carburetor. To attain this synchronization, the following procedure is recommended:

First, after allowing the engine to run until reaching normal operating temperature, turn the stop screw *A* on the left carburetor for fast idle.

Second, pull out coil wire for right bank of cylinders and unlock adjusting screw *D*.

Third, turn out stop screw *B* and adjusting screw *D* so throttle valve in right carburetor will close completely.

Fourth, idle needle valve "14" controls the gasoline mixture at low speeds. Turning it in gives a leaner mixture and out, a richer mixture. Turn the needle in and out until the engine runs smoothly for this throttle position.

Fifth, unlock adjusting screw *C*, turning it out enough so there is sufficient compression on spring *F* to keep throttle in right-hand carburetor closed.

Sixth, lock screw *C* and place wire in coil for right bank of cylinders.

Seventh, turn in stop screw *B* for fast idle and then pull out wire for left bank of cylinders.

Eighth, adjust stop screw *B* for desired speed and adjust idle needle valve "14" in right-hand carburetor. Then turn screw *D* so it just touches throttle lever. Note carefully speed of right-hand cylinders.

Ninth, place wire in coil for left bank, removing wire for right bank and note speed of left cylinders. If speeds of both banks are not the same they can now be adjusted by stop screws *A* and *B*, making sure that screw *D* touches the throttle lever at all times.

Tenth, after both banks of cylinders are turning at the same speed, lock screw *D* and the synchronization is complete.

The choke valves of both carburetors are operated by a single control placed on the dash and care must be exercised when connecting them. Place control wire through wire connectors of both choke valve levers. Then with choke valves in the wide open position, fasten wire connector clamp screws securely. Pull out choke control on dash all the way and observe whether choke valve in each carburetor closes tightly. If one does not, loosen clamp screw, set the choke valve closed and fasten the screw.

### Electrical System

The electrical system is of Delco-Remy manufacture and is of the three-unit type, complete specifications being presented in connection with the wiring diagram appearing in this issue. The ignition system includes two coils each of which supplies high tension current for one bank of six cylinders. The starter is actuated by a Startix which includes a two-way switch by means of which the Startix itself can be cut out of the circuit altogether and the entire potential of the battery is therefore available to the coil. This is done so that in case the car must be started by cranking or pushing as occasionally happens in severely cold weather, the starting motor will not be drawing any current and the full energy of the current will be available for the spark in the combustion chamber.

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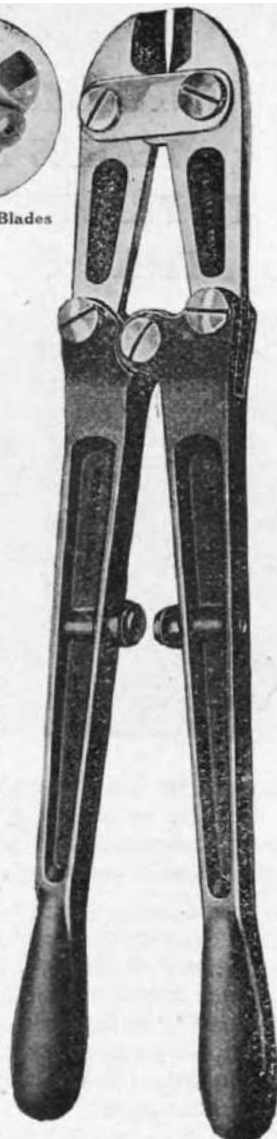
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No. 114—14" Bolt Cutter. Cutting capacity  $\frac{5}{16}$ ", equal to 18" in other makes. Complete with side-cut blades, \$4.00; with end-cut or diagonal-cut blades \$4.40; with center-cut blades, \$4.25.

No. 124—24" Bolt Cutter. Cutting capacity  $\frac{1}{2}$ ", equal to 30" in other makes. Complete with side-cut blades, \$6.50; with end-cut or diagonal-cut blades, \$7.00; with center-cut blades, \$6.75.

**BLADES** for all Bolt Cutters assembled as one unit for quick change or replacement, by the removal of two set screws. No adjustment nuts!

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has superseded Model 8-98 which has been previously covered in this series of articles. The specifications for this model and a wiring diagram are also presented in this issue. Detail changes have been made in this model but the service instructions as presented in the February, 1932, issue, also apply to Model 8-100.

## Some New Books - -

### THE CHEVROLET SIX CAR AND TRUCK —Construction, Operation and Repair. By Victor W. Page.

This new book covers the construction and operation of the chassis and power plant of this popular car in such simple, non-technical language that even a novice can understand it. Many clear and distinctive drawings showing all mechanical parts, illustrate this book, and the repairman will find in it many short-cuts explained that will make repairing much easier and set him up as a Chevrolet expert. The latest synchromesh and free-wheeling transmission is explained in detail and various special tools and fixtures to facilitate work are described. Contains 450 pages; 150 illustrations, and the price is \$2.00. Order through the Book Department, AUTOMOBILE DIGEST, Cincinnati, Ohio.

### OXY-ACETYLENE WELDING AND CUT- TING. By Stuart Plumley.

The first part of the book is given over to twenty lessons which carry the reader or student through the entire field of fundamentals in oxy-acetylene welding and cutting. These lessons include instruction on setting up and handling equipment as well as its actual use in the various phases of the oxy-acetylene work. A student who masters the contents of these twenty lessons may consider himself well-informed indeed.

Part two of the book is new material, this having been added to the first edition, which was very popular. It covers boiler welding laws, codes, hard alloy overlays, welding saws, and a considerable amount of miscellaneous data, applications, methods, etc.

The book has been produced at considerable expense in the way of outlay of money and time. The illustrations are clear and the instructions are so prepared that the average reader can master the context. Anyone desiring to perfect himself in the art of oxy-acetylene welding and cutting may well afford the price of the book, which is \$5.00.

Book of 400 readily understood pages. The welding of steel, cast iron, brazing and silver soldering, welding of aluminum, lead burning, airplane welding, jobs for the shop and all phases of cutting are treated in detail. Order from the Book Department, AUTOMOBILE DIGEST, Cincinnati, Ohio.

### THE STORAGE BATTERY. By C.J. Strickland.

The greatest appeal of this book is the fact that Strickland is a shop man and has incorporated in his book many of those things which can be gained only from natural contact with shop conditions, and the necessary technical data is broken up into easily understood instructions. Not only in the charging and rebuilding end of the battery business, but in the handling of customers and meeting the demands of present-day servicing of batteries.

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"The Storage Battery" is a 110-page book, cloth bound, and is printed on a good grade of paper. The price is \$1.50, a reduction of \$1.00 over the original price. Copies can be supplied direct from this office.

We're uncovering more clever service tips than we had ever dreamed of in that "How I Fixed a Tough Job" contest. Don't hold out—let's have your story, too. Read details of this \$500 prize contest on page 38 of this issue.



## D-R ELECTRICAL EQUIPMENT

(Continued from page 25)

### Adjusting the Current Regulator

1. (A) Connect the negative wire of an accurate reading ammeter to the ammeter binding post on the apparatus box. Connect lead which was connected to this post to positive terminal of ammeter.

(B) While adjusting current regulator the circuit through the contact points of the voltage regulator must be kept closed as when adjusting cutout relay. (See item 3 under cutout relay adjustments.)

(C) Adjust current regulator unit to maximum specified output given for the generator. Loosen lock screw *LS* on current regulator and turn eccentric screw *ES* to the right to decrease the output and to the left to increase the output. See Fig. 3.

(D) On third brush current controlled generators the output is increased by moving the third brush in the direction of armature rotation and in the reverse direction to decrease the output. It is also necessary to have the voltage regulator contacts bridged as specified for adjusting cutout relay. Output should be set at value specified for the generator that is being adjusted.

2. (A) With the armature held down against the core there should be a point opening between the contacts of .012—.015 inches. When gauging the points for correct opening do not move the upper contact from the natural position or the correct setting will not be obtained.

(B) After the point opening has been adjusted to the proper limits tighten the contact screw lock nut assuring no changing in position of contact screw while the regulator is in operation.

(C) The spring holding the upper contact should rise slightly above the fibre insulator when the points are together and at rest so as to insure a wiping action on the points when they are in operation.

The voltage regulator limits and regulates the generator voltage so that it is varied in accordance with the battery requirements. When the battery is low the charging rate is high and when the battery becomes fully charged the charging rate "tapers off" to a minimum.

### Adjusting the Voltage Regulator

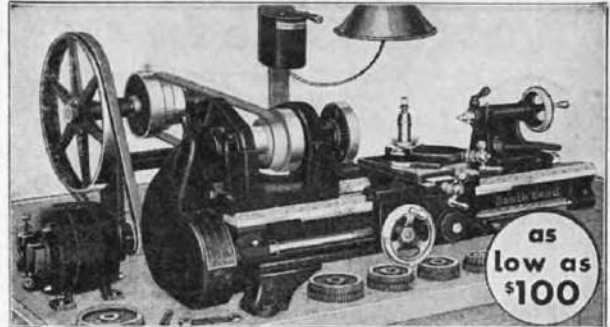
Adjustments to this unit can be made in the following manner:

1. (A) Open the battery circuit by disconnecting the ammeter lead from the ammeter binding post on the apparatus box.

(B) Connect the negative wire of the voltmeter to the ammeter binding post on the apparatus box and the positive wire to the ground.

2. (A) Increase the speed of the engine and adjust the voltage to 14.75—15 volts by loosening the adjusting plate lock screw, *LS*, Fig. 3, and turning the eccentric adjusting screw *ES* to increase or decrease the spring tension. Increasing the spring tension increases the voltage reading.

(B) If an open circuit setting of 14.75—15 volts causes overcharging of the battery this condition can be remedied by decreasing the finish rate of charge.



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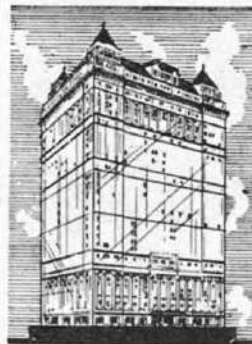
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# Auburn 1925-30

## Motor Tune-Up

If trouble is experienced in obtaining proper motor performance, follow the instructions given in this section closely.

The information contained in the notes is important and should be closely observed.

### Tune-Up Operation

1. Clean and adjust distributor and spark plug points.
2. Check timing chain for slack; adjust if necessary.  
**Note:** Chain adjustment operation is necessary for only those models that have manual timing chain adjustments. If timing chain is loose, proper results cannot be obtained when timing the motor.
3. Synchronize distributor points.  
**Note:** The above operation is necessary only on those models having distributors with two sets of breaker contacts.
4. Check the ignition timing; adjust if necessary.
5. Adjust the valve tappets and free up valves.
6. Clean gas line strainers and screens; also, check gas lines for loose fittings.
7. Check fan and generator belt; adjust if necessary.
8. Tighten water pump nut, this operation is only necessary when packing gland is leaking.
9. Adjust carburetor; clean if necessary.  
**Note:** All Duplex models of Schebler carburetors should be dismantled and cleaned every 15,000 miles of service. If this practice is not followed, plugging of the passage to the main jet may occur as the result of sediment around the base of the needle seat.  
See adjustment precautions under carburetor adjustment.
10. Road test car.  
**Note:** The ignition should never be advanced beyond a point where a spark knock occurs except under full load conditions.

### Timing Precautions

The most critical points to watch in a motor tune-up for all Auburn models are the setting and synchronizing of the ignition timing and valve tappet adjustment.

In synchronizing the ignition, the work should be exact. If a contact point setting is given for a range say of from .018" to .022" the breaker contacts should be set exactly within this range and for best service should be adjusted to the high clearance. This will allow for considerable wear on the breaker arm friction block before the setting reaches the lower limit clearance. Also, when

synchronizing the contact points each set of points should be checked from all four lobes of the cam and if a variation exists the error should be averaged and the points set accordingly.

It will be found that the ignition setting will vary slightly with different kinds of fuel. For example, the ignition timing when non-detonating fuels are used should be advanced slightly over the timing setting when white gasoline is used. These timing adjustments should be determined by road test.

Adjust the valve tappets with the motor running at idling speed, set the tappet clearance so that the feeler gauge will just pass through freely with motor hot. This method of adjusting tappets should be used on all motors where an accurate tappet adjustment is necessary. It eliminates any possibility of clearance errors due to inaccurately machined cam heels or errors in judgment on the part of the mechanic by not having the cam in the proper position for adjustment.

### Sluggish Motor

**Ignition Governor.**—On models equipped with ignition spark governors, the governor should be inspected to see that the weights work freely and do not stick in the retarded position. Any tendency to sticking will cause sluggish motor action.

**High Tension Cable.**—Under the electrical strains developed by the high voltages in high speed, high compression motors, a considerable loss of the secondary current to the spark plugs is sometimes caused by leakage through the high tension wiring even though the insulation seems to be in good condition. Check closely for cracks in the insulation due to corona action and any tendency to softness or bloating of the rubber. This is important and the wiring should be changed if any trouble is experienced.

**Muffler Collapse.**—Sluggishness, poor mileage and heating on models not equipped with muffler by-pass are sometimes caused by the inner partition of the muffler collapsing due to backfiring of the motor.

**Spark Plug Gap Setting.**—In hilly localities, better motor performance can sometimes be obtained by setting the spark plug gaps at .022". If this setting is used readjust the breaker points to approximately .003" less than the spark plug setting.

### Low Gasoline Mileage

**Fuel Pump.**—On models equipped with fuel pump check for porous diaphragm. A small hole will be found in the side of the body of the fuel pump just below the diaphragm. If the diaphragm should become porous or leaky the gasoline passes through the diaphragm and out to the ground through the hole in the fuel pump body. Correct with new diaphragm.

**Heat Manifold Control.**—On the late models check the heat manifold control (Fig. 1) to see that



it is properly adjusted and works freely. If it sticks, poor mileage and motor performance will be the result.

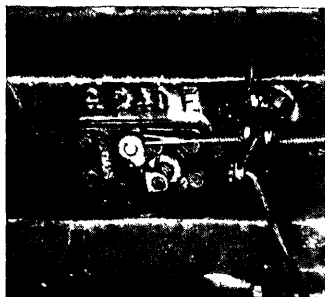


Fig 1

*Showing heat manifold control in open position used on late Auburn cars. The control should be checked from time to time to see that it does not stick and works freely. If this valve sticks it will affect the efficient operation of the carburetor*

**Vacuum Booster.**—On model 6-80 and 6-85 or cars equipped with vacuum booster, better mileage and motor performance can be obtained by replacing the vacuum booster with regular fitting Auburn part No. J-1-227 obtainable at any Auburn service station.

**Carburetor Adjustment.**—Poor gasoline mileage and motor performance may be the result of improper or faulty carburetor adjustment, especially on those cars equipped with Schebler carburetors. Before attempting a carburetor adjustment read the special precautions in carburetor adjustment section.

### Motor Misfiring

**Ignition Lock.**—Motor missing or cutting out may be caused by a small metal chip getting into the armored housing of the Electro-lock close to the distributor assembly at the motor. This trouble is generally the result of rough handling of the distributor when removing it for repairs and appears when the car is in motion on the road. To check, grasp the cable housing with one hand and move it to different positions while the motor is idling on the service floor. If the motor cuts out or misses when the cable housing is disturbed, repair or replace with new cable.

**Spark Plugs.**—In cases of motor missing, spark plugs should be checked closely. Very often spark plugs will stand up under bench pressure tests but will break down in the motor due to cracks in the porcelain opening up under the influence of heat.

### Motor Noise

**Fuel Pump.**—A noise similar to a loose valve tappet may be caused by a defective contact of the fuel pump actuating lever arm against the camshaft or a weak diaphragm spring. To correct if caused by pump lever arm, either dress with file or replace the arm; if caused by weak spring, replace.

**Oil Pump Check Valve.**—A slight knock similar to a loose valve tappet may be caused by the oil pump check valve. To check, grasp the oil line to the oil gauge under the dash with the hand. This will deaden the noise if the trouble is in the check valve.

If replacing the check valve spring and plunger does not relieve the trouble, drill 3/32" hole in plunger.

**Muffler Noise.**—Peculiar noises at high speeds may be due to resistance in the exhaust line caused by the collapsing of the inner lining of the muffler. This condition is generally the result of backfiring of the motor.

**Valve Spring Whip.**—A clattering noise at high motor speeds may be caused by what is known as valve spring whip. If the trouble is not caused by weak or defective springs, it can be corrected by inserting washers at the top of the spring.

**Fan Belt Slipping.**—A peculiar whistling noise may be caused by fan belt slipping at speeds from about 38 to 45 miles per hour (see motor vibration).

**Manifold Warping.**—On models 120 and 125 a hissing noise, similar to a blown exhaust gasket when the car is driven at from 45 to 50 miles per hour may be caused by the intake manifold warping and pulling away from the center bank of four cylinders. This condition is caused by the cold air from the radiator striking the hot exhaust manifold and only occurs when the car is traveling at high speed along the road and cannot be detected when the car is tested on the service floor.

To correct the trouble use two gaskets instead of one on the offending ports.

### Motor Vibration

**Fan Belt Slipping.**—A very bad vibration of the motor at car speeds of from 38 to 45 miles per hour may be caused by slipping of the fan belt. The vibration is set up as the result of whipping of the loose belt.

### OIL PRESSURE

Model and Year	Min	Max.
6-63-1925	5 lbs	40 lbs.
6-43-1925	5 lbs.	20 lbs
8-63-1925	5 lbs.	40 lbs
8-88-1925	10 lbs	30 lbs.
4-44-1926	10 lbs.	40 lbs.
6-66-1926	5 lbs	40 lbs
8-88-1926	10 lbs.	30 lbs.
6-66-1927	5 lbs	40 lbs
8-77-1927	5 lbs	40 lbs.
8-88-1927	10 lbs	30 lbs
6-76-1928	40 to 60 lbs at 40 M P.H.	
115-1928	25 lbs at 35 M P H.	
6-80-1929	30 to 60 lbs at 40 M.P.H.	
8-90-1929	25 lbs at 30 M.P.H.	
120-1929	25 lbs at 30 M P.H.	
125-1930	15 lbs	50 lbs
8-95-1930	15 lbs	40 lbs
6-85-1930	15 lbs	40 lbs

### IGNITION TIMING

**Models 6-63-1925, 6-43-1925, 8-63-1925, 8-88-1925-26-27, 4-44-1926, 6-66-1926-27, 8-77-1927.**—The spark is timed to fire at top dead center of the compression stroke with the spark in fully retarded position.



On the earlier engines the opening in flywheel housing used for timing purposes is on the top face of the housing. On the later series, this hole is on the bottom front face of the flywheel housing. No. 1 dead center mark on the flywheel should be opposite the center line of the opening. In setting the flywheel, be sure that No. 1 cylinder is on the compression stroke. This can be determined by checking to see that both valves are closed on No. 1 cylinder.

If, for any reason, it should be found necessary to advance or retard the ignition on this setting, all that is necessary is to loosen the clamp screw on the advance arm and rotate the distributor in the desired direction.

In no case should the ignition be advanced beyond a point where a spark knock is heard except under full load conditions.

On 8 cylinder models using an 8 lobe cam, two sets of contact points in series are used. Adjust one set of points to a clearance of .019" and the other set to .022". The ignition timing is set by the pair of points last to break.

### Ignition Timing Table

The following table contains complete ignition timing specifications. See timing precautions under Motor Tune-Up above.

YEAR	MODEL	Con Pt Clear	IGNITION TIMING			Spark Lever Position	Plug Gap	Firing Order
			Fly-Wheel Travel	Piston Travel	Dead Center Position			
1925	6-63	.025"	T D C	T D C	T D C	Ret	.030"	1-5-3-6-2-4
1925	6-43.....	.025"	T D C	T D C	T D C	Ret	.030"	1-5-3-6-2-4
1925	8-63	.018"	T D C	T D C	T D C	Ret	.024"	1-6-2-5-8-3-7-4
1925	8-88	*.018"-.022"	T D C	T D C	T D C	Ret	.025"	1-6-2-5-8-3-7-4
1926	4-44	.025"	T D C	T D C	T D C	Ret	.030"	1-3-4-2
1926	6-66	.025"	T D C	T D C	T D C	Ret	.025"	1-5-3-6-2-4
1926	8-88	*.018"-.022"	T D C	T D C	T D C	Ret	.025"	1-6-2-5-8-3-7-4
1927	6-66	.018"-.022"	T D C	T D C	T D C	Ret	.025"	1-5-3-6-2-4
1927	8-77	*.018"-.022"	T D C	T D C	T D C	Ret	.025"	1-6-2-5-8-3-7-4
1927	8-88	†.018"-.022"	T D C	T D C	T D C	Ret	.025"	1-6-2-5-8-3-7-4
1928	6-76	.024"	T D C	T D C	T D C	Adv	.025"	1-5-3-6-2-4
1928	8-88	†.018"-.022"	T D C	T D C	T D C	Ret	‡.025"	1-6-2-5-8-3-7-4
1928	115	†.018"-.022"	6°	.012"	B T C	Adv	‡.025"	1-6-2-5-8-3-7-4
1929	6-80	.018"-.022"	10°		B T C	Adv	.025"	1-5-3-6-2-4
1929	8-90	†.018"-.022"	6°	.013"	B T C	Adv	‡.025"	1-6-2-5-8-3-7-4
1929	120	†.018"-.022"	6°	.013"	B T C	Adv	‡.025"	1-6-2-5-8-3-7-4
1930	125	.018"-.022"	7 1/2°		B T C	Adv	‡.030"	1-6-2-5-8-3-7-4
1930	8-95	.018"-.022"	7 1/2°		B T C	Adv	‡.030"	1-6-2-5-8-3-7-4
1930	6-85	.018"-.022"	5°		B T C	Adv	‡.030"	1-5-3-6-2-4

B T C —Before top center T D C —Top dead center

\*This type of distributor has two sets of contact points which are opened simultaneously by a hardened steel cam with 8 lobes

†This type of distributor uses a 4 lobe cam with two sets of contact points connected in parallel (See Ignition Timing—To synchronize breaker arm on 8 cylinder distributors with 4 lobe cam)

‡In some instances in hilly localities, better motor performance can be obtained by setting the spark plug gaps at .022". If this setting is used, readjust the breaker points to approximately .003" less than the spark plug setting

**Model 6-76-1928.**—To time the spark to the motor the flywheel must be set so that No. 1 cylinder is at T.D.C. on the firing stroke. The opening in flywheel housing used for timing purposes, is on the bottom front face of the housing. No. 1 dead center mark on the flywheel should be opposite the center line of this opening. With the spark lever in full advance position, the contact points should just begin to break.

A small amount of variation can be taken up by loosening the clamp on the advance arm and then turning the distributor head. If there is not enough clearance between the cables and the cable-tubes, it will be necessary to remove the distributor and readjust the driving coupling on the end of the shaft.

To advance or retard the spark rotate the distributor in the desired direction.

The ignition should never be advanced beyond a point where a spark knock occurs except under full load conditions.

**Model 6-80-1929.**—To time the spark to the motor, the flywheel must be set so No. 1 cylinder is 10° ahead of top dead center on firing stroke; that is, turn crank clockwise until mark on flywheel lacks 3 teeth of reaching top center position. In this position the spark lever on the steering column should be set at full advance. The distributor should then be set so that the contact points are just breaking for No. 1 cylinder. A small amount of variation can be taken up by loosening the clamp on advance arm and then turning distributor ahead. If there is not enough clearance between the cables and cable-tubes, it will be necessary to remove the distributor and readjust the driving coupling on the end of the shaft.

To advance or retard the ignition rotate the distributor housing in the desired direction.

The ignition should not be advanced beyond a point where a spark knock is heard except under full load conditions.

The opening in flywheel housing used for timing purposes is on bottom front face of housing. No. 1 dead center mark on flywheel should be opposite center line of this opening.

**Models 115-1928, 8-90 and 120-1929.**—To time the spark to the motor, the flywheel must be set so No. 1 cylinder is 6° ahead of top dead center on the firing stroke; that is, turn crank clockwise until mark on flywheel lacks two teeth of reaching top center position. In this position, the spark lever on steering column should be set at full advance. The distributor should then be set so the contact points are just breaking for No. 1 cylinder. A small amount of variation can be taken up by loosening the clamp on advance arm and then turning distributor ahead. If not enough clearance between cables and cable-tubes, remove the distributor and readjust the driving coupling on the end of shaft.

To advance or retard the ignition rotate the distributor in the desired direction.

The ignition should not be advanced beyond a point where a spark knock occurs except under full load condition.



The opening in flywheel housing used for timing purposes, is on bottom front face of housing. No. 1 dead center mark on flywheel should be opposite the center line of this opening.

**Auburn Model 125 and 8-95 1930.**—Crank the motor until No. 1 piston is entering compression stroke. Continue cranking until the flywheel is  $7\frac{1}{2}^\circ$  or approximately  $2\frac{1}{2}$  ring gear teeth before top center. At this point the breaker contacts should just start to open with spark lever fully advanced.

If it should be desired to set ignition timing by top dead center marks the contact points should just start to open with advance lever in one-half advance position on the quadrant with No. 1 piston at top dead center. Final check and adjustment should be made by road testing the car. See table for contact point setting.

On 8 cylinder models using an 8 lobe cam, two sets of contact points in series are used. Adjust one set of points to a clearance of .019" and the other set to .022". The ignition should be set by the last pair of points to break.

**Auburn Model 6-85 1930.**—Crank the motor until the piston in No. 1 cylinder is entering compression stroke; continue cranking until the flywheel is  $5^\circ$  or approximately 1.3 ring gear teeth before top dead center. At this point the breaker contacts should just start to open with spark lever fully advanced.

If it should be desired to set ignition timing by top dead center marks the contact points should just start to open with advance lever in one-half advance position on the quadrant with No. 1 piston at top dead center. Final check and adjustment should be made by road testing the car. See table for contact point setting.

**To synchronize breaker arm on 8 cylinder distributors with 4 lobe cam.**—One set of contact points is stationary and the other set is movable. The stationary set is adjusted first and synchronizing is completed by adjustment to the movable set of points. To set contact opening of arm (A), Fig. 2, turn distributor shaft in its direction of rotation which is clockwise viewed from top until rubbing block of breaker arm (A), is on lobe of cam. Loosen screw (B), and turn screw (C) to get contact opening which should be from .018" to .024" and preferably .022". Tighten screw (B).

Again turn the shaft until rubbing block of breaker arm (D), is on lobe of cam. Loosen screw (E), turn screw (F) until points open between .018" and .024" and preferably .022". Tighten screw (E).

Put synchronizing tool over cam, locking it with the slide pushed through showing the arrow that points in the direction the shaft rotates as viewed from top.

Turn shaft clockwise (looking from top) until breaker arm (A) breaks contact. Note marking on (M) side of synchronizing tool that is in line with point (X) which is the edge of slot in distributor base rim. Continue to turn shaft until the same

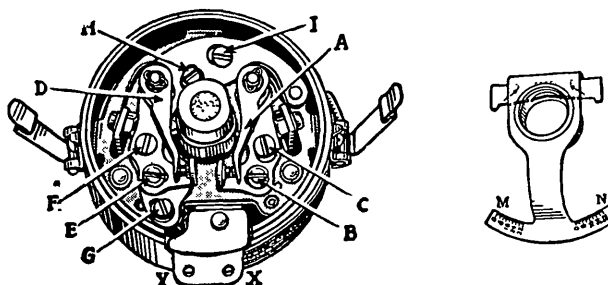


Fig 2

*Two types of 8 cylinder distributors were used on Auburn cars. The first type has an 8 lobe cam with two sets of contact points in series opening simultaneously. The second or latest type (Fig 2) uses a 4 lobe cam with two sets of contact points in parallel.*

marking on (N) side of tool is in line with point (X). Loosen screws (G) and (H) and turn screw (I) until arm (D) breaks contact. Check this by rotating shaft again. Tighten screws (G) and (H). Also check contact opening of breaker arm (D), and if it was set before at .022", it should still be within the limits. If outside of these limits, reset the point opening and synchronize arms again. Do not make any adjustments to arm (A), but confine the adjustments to arm (D) to complete the synchronizing.

The graduations on the tool represent engine degrees and the breaker arm must not be out of synchronism more than two engine degrees.

The eye cannot detect the moment the points open, and to get an accurate synchronizing adjustment, an ammeter should be connected in the ignition circuit at the distributor terminal. If on the car, make sure ignition switch is "on." The instant the ammeter needle drops back to zero, the points open.

## VALVE TIMING

**Model 663-1925.**—Set the exhaust valve tappet clearance for No. 1 cylinder at .006". Crank the engine until the exhaust valve just closes. At this point the flywheel mark "I-O-E-C-1-6" should be under the indicator at the top of the flywheel housing.

**Model 6-43-1925.**—Set the exhaust valve tappet clearance for No. 1 cylinder at .007". Crank the engine until the exhaust valve just closes. At this point, the flywheel mark "T.D.C." should be  $\frac{1}{8}$ " past the indicator mark at the top of the flywheel housing.

**Model 8-63-1925, 8-77-1927, 8-88-1925-26-27-28, 6-76-1928.**—Set the intake valve tappet clearance for No. 1 cylinder at .010". Crank the engine until the intake valve just starts to open. At this point, the flywheel mark "T-C 1&8" should be under the indicator in the peek hole in the flywheel housing.

**Note:** This clearance should be reset after timing operation is complete. (See table for VALVE CLEARANCE.)



### Valve Timing Table

The following table contains complete valve timing specifications. Valve tappet adjustments for all late models are critical and should be made with engine idling. See timing precautions above.

YEAR	MODEL	TAPPET ADJUSTMENT				VALVE TIMING			
		For Timing		Running		Fly-Wheel Travel	Piston Travel	Int. Valve	Exh. Valve
		Int	Exh	Int	Exh				
1925	6-63	.006"	.006"	.004"H	.006"H	63/64" A		Opens	Closes
1925	6-43		.007"	.004"H	.006"H	1/8" A			Closes
1925	8-63	.010"		.006"H	.008"H	D C		Opens	
1925	8-88	.010"		.006"H	.008"H	D C		Opens	
1926	4-44	.008"		.004"H	.006"H	D C		Opens	
1926	6-66	.010"		.006"H	.008"H	D C		Opens	
1926	8-88	.010"		.006"H	.008"H	D C		Opens	
1927	6-66 Lyc	.010"		.006"H	.008"H	D C		Opens	
1927	6-66 Cont		.007"	.004"H	.006"H	1° A			Closes
1927	8-77	.010"		.006"H	.008"H	D C		Opens	
1927	8-88	.010"		.006"H	.008"H	D C		Opens	
1928	6-76	.010"		.006"H	.008"H	D C		Opens	
1928	8-88	.010"		.006"H	.006"H	D C		Opens	
1928	115	.010"		.006"H	.006"H	D C		Opens	
1929	6-80	.010"		.006"H	.006"H	D C		Opens	
1929	8-90	.010"		.006"H	.006"H	D C		Opens	
1929	120	.010"		.006"H	.006"H	D C		Opens	
1930	125	.010"		.006"H	.008"H	*5° B		Opens	
1930	8-95	.010"		.006"H	.008"H	*5° B		Opens	
1930	6-85	.010"		.006"H	.008"H	*5° B		Opens	

A — After top center B — Before top center D C — Top dead center  
H — Hot setting If no symbol is given set tappets cold

\*5° of flywheel travel is approximately 1 68 ring gear teeth on Model 125 and 1 30 ring gear teeth on Models 8-95 and 6-85

**Model 6-66.**—(Continental motor).—Set the intake valve tappet clearance for No. 1 cylinder at .010". Crank the engine until the intake valve just starts to open. At this point the flywheel mark "T.C.-1&6" should be under the indicator at the top of the flywheel housing.

**Note:** The valve tappet clearance should be reset after the timing operation is complete. (See table for VALVE CLEARANCE)

**Model 6-66.**—(Lycoming motor).—Set the intake-exhaust valve tappet clearance for No. 1 cylinder at .007". Crank the engine until the exhaust valve just closes. At this point, the flywheel mark "1-EX-C" should be under the indicator at the top of the flywheel housing.

**Model 4-44-1926.**—Set the intake valve tappet clearance for No. 1 cylinder at .008". Crank the engine until the intake valve just starts to open. At this point, the pistons for No. 1 cylinder should be at T.D.C.

**Note:** The valve tappet clearance should be reset, after the timing operation is complete (see table VALVE CLEARANCE).

**Models 115 1928, 8-90 1929, 120 1929.**—Set the intake valve tappet clearance for No. 1 cylinder at .010". Crank the motor until No. 1 piston is at T.D.C. as indicated either by flywheel or piston travel. With the piston in this position, the intake valve for No. 1 cylinder should just start to open.

After the timing operation is complete, reset the valve tappets to the proper running clearance. See table for Timing Clearances.

**Model 6-80 1929.**—Set the intake valve tappet clearance for No. 1 cylinder to .010". Crank the motor until the piston in No. 1 cylinder is at T.D.C. flywheel travel. At this position, the intake valve should just begin to open.

After the timing operation is complete, the valve tappets should be reset to the correct running clearance. See timing information in timing table.

**Auburn Models 125, 8-95 and 6-85 1930.**—Set intake valve for No. 1 cylinder to .010" clearance. Crank motor until piston in No. 1 cylinder is at top dead center exhaust stroke. At this point the intake valve should just start to open. The keyway in the front end of the crankshaft, where starting crank engages, will be on top of shaft and straight up and down when No. 1 piston is at top dead center.

### CHAIN ADJUSTMENT

**Model 6-43-1925, 6-66-1926-27, 115-1928, 120-1929, 125-1930.**—Chain sag is adjusted by manual take-up. To tighten the chain, loosen the generator bolts slightly and swing the generator away from the engine until the chain begins to hum, then loosen just enough to stop the hum.

### GAS LINE SCREENS

**All models of Auburn** equipped with vacuum tank feed have two strainer screens in the gas line; one is located in the head of the vacuum tank as shown at (A, Fig. 3) and the other is located at the carburetor.

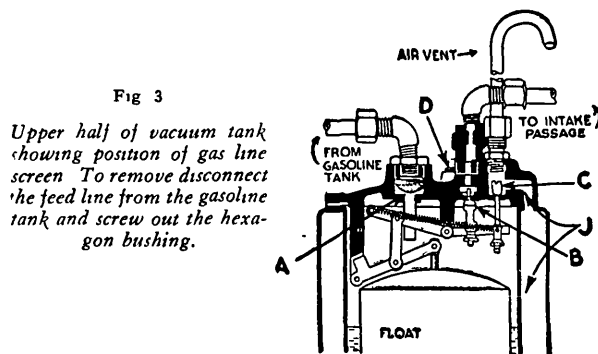


Fig. 3  
Upper half of vacuum tank showing position of gas line screen. To remove disconnect the feed line from the gasoline tank and screw out the hexagon bushing.

To clean the gas line screen (A, Fig. 3) at the vacuum tank, disconnect the gas lines from the gasoline supply tank and remove the elbow and bushings together with the gasoline strainers. Clean with air and gasoline.



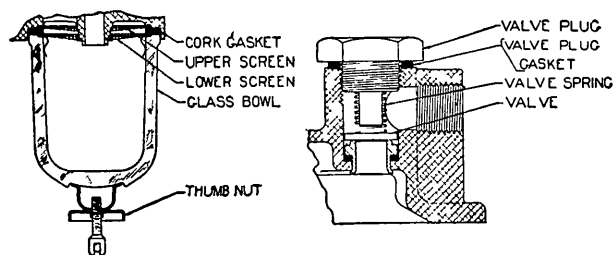


Fig. 4

*Cross section view of fuel pump glass bowl and pump valve. Note the two strainer screens and position of cork gasket at the top of the glass bowl.*

*The valve disc is held in position by a spring which in turn is held in place by the valve plug. If valve plug is removed see that valve plug gasket is in good condition when plug is replaced.*

**All models equipped with fuel pump feed** have strainer screens in the top of the gasoline bowl at the fuel pump (Fig. 4) and at the carburetor.

To clean the fuel pump screens, remove the glass bowl and clean the screen assembly. Make certain that the cork gasket is in good condition and properly seated when reassembling the bowl into position. If the gasket is damaged, replace with a new one.

On Schebler Model S carburetor, having a brass bowl, the strainer screen can be removed for cleaning by first disconnecting the gasoline line and unscrewing the hexagon nut screw (B, Fig. 5). Remove the gauze and clean thoroughly by washing in gasoline and blowing through it with compressed air. Clean the inside of the strainer body thoroughly and reassemble, making sure the gaskets are in place, and that the hexagon nut and gasoline line are properly tightened and do not leak.

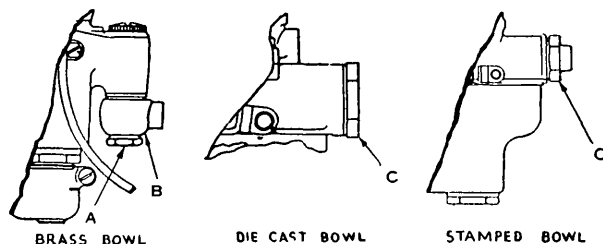


Fig. 5

*Showing gasoline connection for three types of Schebler Model S carburetors.*

To remove the strainer screen on Schebler carburetors equipped with die cast or stamped bowl, disconnect the gas line and remove the hexagon bushing (C, Fig. 5).

## FUEL PUMP

### Repairs Made Without Dismantling Pump.—

In the event of no fuel in the carburetor, the system should be checked for leaks or split seams in the gas line, or the gas line becoming kinked or flattened by the automobile body resting upon it. Occasionally, due to the fact that the gasoline line extends to the bottom of the gas tank, a little sedi-

ment is drawn from the bottom of the tank, blocking off the flow of fuel.

Other troubles which may be corrected without disturbing the fuel pump installation are loose pipe fittings at the gasoline tank and the pump.

**Loose glass bowl**, which should be tightened by the retaining nut, making sure that the cork gasket lies flat on its seat and is not broken.

**Dirty Screen.**—To correct this trouble remove the glass bowl and clean the screen assembly. Make certain that the cork gasket is in good condition and properly seated when reassembling the bowl into position. If the gasket is damaged replace with a new one.

**Loose Valve Plugs.**—Tighten the valve plugs securely. If necessary replace the valve plug gaskets.

**Leaks at the Diaphragm.**—Tighten the cover screws evenly and securely. Shellac should be applied to the edge of the diaphragm, either under the diaphragm on the surface which comes in contact with the fuel pump body or on the outside of the body at the point where the diaphragm protrudes. Sometimes there appears to be a leak at the diaphragm, whereas the leak actually exists at the pipe fitting and has run down the pump body to the diaphragm flange, appearing to originate there.

## Carburetor Specifications

### FLOAT LEVEL

#### Schebler Carburetors

In making repairs to a Schebler carburetor, it is very important when reassembling to be sure that you have the proper float level. Holding the float, which is assembled to the float lever, you can easily bend it up or down in order to set the float at the proper distance to obtain correct float level. The float lever measurement should be taken at the point between the top of the float and the carburetor body as shown in Fig. 5A.

**Model S-1½", Die Cast.**—Adjust the float ⅛" to 5/32" measuring between the float and carburetor body when float valve is seated.

**Model S-1¼", Duplex.**—Float level 25/64" to 27/64" measuring between the float and carburetor body when the float valve is seated.

**Model S-1", Stamped Bowl.**—Float level ⅛" to 5/32" measuring between the float and carburetor body when float valve is seated.

**Model S-1"-1¼"-1½", Brass Bowl.**—Float level with float in bowl, 5/32" from top of bowl casting to top of float when float valve is seated.

**Model U-1" and 1¼"**—When repairing a Schebler model U carburetor a correct float level adjustment can be obtained by bending the float lever up or down.

With the float assembly in lower half of body, hold body up-side-down with float lever resting on float valve so that it is seated. Measure from flange on lower half of body to top of float. This should measure 2" on the 1" carburetor and 1 15/16" on



the 1/4" carburetor. Be sure to remove the bowl gasket before taking this measure.

On all new Model U Schebler carburetors, used on Auburn, set the float level so that the float lever arm is parallel with the flange of the carburetor body when needle valve is in the closed position.

### Stromberg Carburetors

**Model 002.**—The float valve controls the fuel level in the customary way, the carburetor being designed to operate under a standing level of 1" below the machined top of the float chamber.

On most of the model 0 series carburetor, there is a float chamber plug in the side of the float chamber, when this is removed, the fuel should stand exactly even with the bottom of the hole when engine is not running.

When the engine begins to draw fuel from the float chamber, the level goes down slightly, about 3/32"

The float level may be adjusted by screwing float needle valve up or down in the sleeve which engages the float levers, screwing the needle down will lower the level and also decrease the amount that the float needle can raise before the float strikes on its bottom, while screwing the needle upward in the sleeve will raise the level and give the float needle more travel.

It is usually the case that with the level properly adjusted, the float needle will have a motion up and down of 3/64"

**Model R-1.**—The proper float level with engine not running is one inch from the top surface of float chamber. Should the level be more than 1/16" higher or lower the float needle should be readjusted. Remove valve cap (Fig 16) and upper end of float needle stem will be seen. If level is too high, loosen lock nut, hold needle sleeve from turning by putting small wrench on flat sides and screw needle down, clockwise, one turn, which should lower level about three thirty-seconds of an inch, if too low, a full turn of needle upward will raise level same distance.

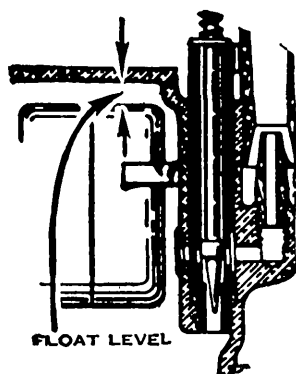


Fig 5A

Showing point at which float level should be measured on Schebler Model S carburetors. The quickest method for checking the float level of Schebler carburetors is to see that the float lever arm stands parallel with the milled flange of the carburetor body.

## CARBURETOR SPECIFICATION DIAGNOSIS

Schebler Carburetor Specifications include only those parts that are most likely to be at fault if a correct carburetor adjustment cannot be obtained.

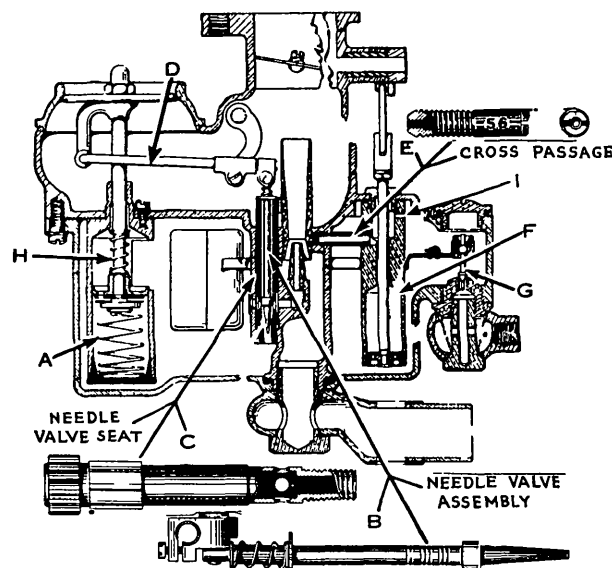


Fig 6

Cross section of Schebler Model S carburetor showing (A) lower air valve spring (B) needle valve assembly. The size number of the needle valve is indicated by the number of rings machined on the body of the needle as shown (C) needle valve seat. Due to the slight amount of wear on this part it rarely needs changing (D) needle valve lift lever (E) metering or cross passage. The size of this part is stamped on the side of the body as shown (F) accelerating pump assembly (G) float needle valve assembly (H) upper air valve spring.

### Schebler "S" Carburetors

Each set of Schebler specifications is given for a given size motor. To determine the specifications for any particular model of Auburn, first find the size of the motor in the table of Motor Specifications in the carburetor adjustment section and then refer to the Carburetor Specifications listed below for that size motor.

#### Engine Size 3 1/8" x 4 1/4"

DESCRIPTION OF PART	Part No or Size
Air Valve Spring—(A, Fig 6)	48 U
Needle Valve complete—(B, Fig 6)	No 1
Accelerating Pump Cross Passage—(E, Fig 6)	No 54
Accelerating Pump Cylinder—(F, Fig 6)	No 36

#### Engine Size 3 1/8" x 4 1/2"

DESCRIPTION OF PART	Part No or Size
Air Valve Spring—(A, Fig 6)	48 U
Needle Valve complete—(B, Fig 6)	No 5
Accelerating Pump Cross Passage—(E, Fig 6)	No 54
Accelerating Pump Cylinder—(F, Fig 6)	No 36

#### Engine Size 2 3/4" x 4 3/4"

DESCRIPTION OF PART	Part No or Size
Air Valve Spring—(A, Fig 6)	48 U
Needle Valve complete—(B, Fig 6)	No 5
Accelerating Pump Cross Passage—(E, Fig 6)	No 52
Accelerating Pump Cylinder—(F, Fig 6)	No 36

#### Engine Size 3 1/4" x 4 1/2"

DESCRIPTION OF PART	Part No or Size
Air Valve Spring—(A, Fig 6)	48 U
Needle Valve complete—(B, Fig 6)	No 5
Accelerating Pump Cross Passage—(E, Fig 6)	No 54
Accelerating Pump Cylinder—(F, Fig 6)	No 36



**Engine Size 27/8" x 4 3/4"**

DESCRIPTION OF PART	Part No. or Size
Air Valve Spring—(A, Fig. 6).....	48 U
Needle Valve complete—(B, Fig. 6).....	No. 1
Accelerating Pump Cross Passage—(E, Fig. 6).....	No. 54
Accelerating Pump Cylinder—(F, Fig. 6).....	No. 36

**Stromberg Carburetors**

Stromberg Carburetor Specifications are given for each model of carburetor. To determine the specifications for any particular model of Auburn equipped with Stromberg, first find the model of carburetor in the table of Motor Specifications in the Carburetor Adjustment section and then refer to the specifications below for that model of Stromberg carburetor.

**Model 00-2.**—The following table contains specification data for Stromberg Model 00-2 carburetors used on late model Auburn cars.

OO-2 MODEL	OO-2
NAME	1 1/4"
*Large Venturi.....	31/32"
*Main Discharge Jet.....	A-28 B-20
*Well Bleeder.....	43 Fixed
*High Speed Bleeder.....	70
*Accelerating Nozzle.....	53
*Gasoline Reducer.....	54
*Idling Discharge Holes.....	2-56 lower, 1-56 top
*High Speed Needle Seat.....	40
*Float Needle Seat.....	140"
Small Venturi Tube.....	15/32"
Idle Needle Seat.....	56
Idle Tube Feed Hole.....	72
Idle Tube Bleeder Holes.....	2-58
*Idle Air Reducer.....	60
*Thermostat Reducer.....	45
Main Dis. Jet (Hole in Neck).....	1-60
Main Dis. Jet (Side Holes).....	2-60, 1 wall
Main Dis. Jet (Bottom Hole).....	1-60
Outside Diameter Air Horn.....	2-19/32"
Inside Diameter Air Horn.....	2 3/8"
Flange Centers.....	3 1/16"x1 47/64"
Flange Drill.....	11/32"

\*Variable Specification.

**Model R.**—The following table contains carburetor specification data for Stromberg Model R carburetors used on the early models of Auburn.

MODEL R	R-1
NAME	1"
*Large Venturi.....	7/8"
*Main Discharge Jet.....	30-20
*Accelerating Well Bleeder.....	65
*High Speed Bleeder.....	70
*Idling Discharge Jet.....	56-66
*H. S. Needle Seat.....	53
*Float Needle Seat.....	113"
Small Venturi.....	7/16"
Idle Tube Bleed Holes.....	2-65
Idle Tube Nozzle.....	65
Main Dis. Jet (Holes in Tip).....	4-54
Main Dis. Jet (Holes in Neck).....	2-55
Main Dis. Jet (Holes in Side).....	64-60-58
Main Dis. Jet (Filler Holes).....	6-54
Main Dis. Jet (Idle Feed Holes).....	4-60
Flex. Tube (Fits Inside Horn).....	1 1/2"
Flex. Tube (Fits Outside Horn).....	1 1/2"
Flange Centers.....	2 3/8"
Size Drill.....	11/32"

\*Variable Specification.

**Carburetor Adjustment****MOTOR SPECIFICATIONS**

The following table lists the model and year of car, engine specifications, make, model and size of carburetor.

Car and year	Model	Engine make and model	Nr.	Bore and stroke	Carb. model and size
<b>AUBURN</b>					
1924-25	8-63	Lyc.	8	3 1/8" x 4 1/4"	<b>SCHEBLER</b>
1925-26	8-88	Lyc.	8	3 1/8" x 4 1/2"	S-1 1/4"
1925	6-66	Lyc.	6	3 1/8" x 4 1/2"	S-1"
1925-27	6-66	Lyc.	6	3 1/8" x 4 1/2"	S-1"
1926	8-88	Lyc.	8	3 1/8" x 4 1/2"	S-1 1/4"
1927-88	8-77	Lyc. GT.	8	2 3/4" x 4 3/8"	S-1 1/2"
1927-28	8-88	Lyc. 4 HM.	8	3 1/8" x 4 1/2"	S-1 1/2"
1927-28	6-66	Cont. 7 R.	6	2 7/8" x 4 3/8"	S-1"
1928	6-66	Lyc.	6	3 1/8" x 4 1/2"	S-1 1/4"
1928	8-88	Lyc.	8	2 7/8" x 4 3/8"	S-1 1/4" Dplx.
1928	115	Lyc.	8	3 1/8" x 4 1/2"	S-1 1/4" Dplx.
1928	88	Lyc. GS.	8	2 7/8" x 4 3/8"	S-1 1/4" Dplx.
1928	6-66	Lyc.	6	3 1/8" x 4 1/2"	S-1 1/4"
1928	115	Lyc. 4 MD.	8	3 1/8" x 4 1/2"	S-1 1/4" Dplx.
1929	6-80	Lyc. WS.	6	2 7/8" x 4 3/8"	S-U x 24-1 1/4"
1929	8-90	Lyc. GS.	8	2 7/8" x 4 3/8"	S-1 1/4" Dplx.
1929	120	Lyc. MD.	8	3 1/8" x 4 1/2"	S-1 1/4" Dplx.
1930	125	Lyc. MDA.	8	2 7/8" x 4 3/8"	UX-51 1 1/2"
1930	8-95	Lyc. GR.	8	2 7/8" x 4 3/8"	UX-24 1 1/4"
1930	6-85	Lyc. WR.	8	3 1/8" x 4 1/2"	S-1 1/4"
<b>STROMBERG</b>					
1924-25	6-43	Cont. 7-U.	6	3 1/8" x 4 1/4"	R-1
1928	8-88	Lyc. GS.	8	2 3/4" x 4 3/8"	00-2
1928	115	Lyc. MD.	8	3 1/8" x 4 1/2"	00-2

**ADJUSTMENT PRECAUTIONS**

The adjustment information for carburetors used on Auburn automobiles from 1925 to 1930 inclusive is given by carburetor model rather than by car model. If it is desired to know what make and model of carburetor was used on any particular car model, refer to the motor specification table above.

On the late model cars gasoline mileage and engine performance are dependent more than ever before upon a correct carburetor adjustment; therefore, it is suggested that the information found under adjustment precautions be closely observed.

**Manifold Effect on Carburetor Adjustment.**

It is important when making a carburetor adjustment that from 10 to 15 seconds time be allowed after each movement of the adjusting screw for fuel that has accumulated in the manifold to pass into the motor. Especially is this true when making a range adjustment on Schebler Model U carburetors. Take for example, an adjustment from a rich to a lean mixture; the tendency is for the fuel to pile up on the walls and in the corners of the manifold so that unless sufficient time is allowed for this fuel accumulation to pass into the motor, an accurate adjustment can not be obtained. Insufficient time allowance is generally indicated by the motor performance gradually improving and then the motor suddenly dying during the adjustment operation.

**Adjustment for Gasoline Mileage.**—The best adjustment for gasoline economy is obtained by leaning the mixture down until the motor runs rough and then richening it up just to the point of where the motor runs smoothly. This is espe-



cially true of the idle and range adjustments and should be done with care for best results. When adjusting the carburetor from a lean to a richer condition, it will be found that due to the flexibility of adjustment there is a wide range between the point where the motor smooths out from a lean mixture to a point of where the adjustment is too rich. Richening of the mixture beyond the point of smooth motor operation adds nothing to the performance of the car and lowers the gasoline mileage.

**Effect of Leaky Bowl on Adjustment.**—On all Model U Schebler carburetors, a correct adjustment cannot be obtained unless the gasoline bowl is absolutely tight against the body flange. If the bowl has been removed for any reason, a new bowl gasket should be used and checked for leaks.

**Idle Adjustment on Early Models 8-88 and 115.**—On some of the early model 8-88 and 115 cars equipped with Schebler Model S carburetors, no stop was provided on the idle adjustment so that caution should be exercised not to screw the adjustment out of gear. By turning the idle adjustment screw more than 30 or 40 notches either to the right or left, there is danger that the vertical gear will drop away from the adjusting screw gear which would necessitate dismantling the carburetor.

This trouble can be checked by depressing the air valve and holding a small light in such a position that the gears can be seen through the air valve opening while turning the adjusting screw either to the right or the left.

**Air Valve Flutter.**—Fluttering of the air valve may be caused by a weak air valve or dash pot spring (A Fig. 6). A weakened spring will also make a correct adjustment difficult, with a tendency to a rich mixture at speeds above idling.

**Acceleration.**—If the motor seems to run rich after acceleration at the average driving speed (20 to 30 miles per hour) for a distance, it is due to too much gasoline being supplied from the accelerating pump.

**Deceleration.**—A decelerating device is used on Schebler Model S-1½" carburetors. If the motor refuses to return to the low idle on cars equipped with this type carburetor there is probably dirt in the device and the device should be taken out and thoroughly washed in clean gasoline.

The decelerating device increases the idling speed temporarily after the throttle has been returned to the idling position from a part or wide open throttle. In other words, if you drive along, say at five miles per hour, kick open the throttle and accelerate to ten or fifteen miles per hour, or to any speed, then let the foot accelerator back to idle, the idling speed will be increased considerably for about ten seconds, when the decelerating device will close off, allowing the motor to idle at the normal speed.

## SCHEBLER "S" BRASS BOWL

**Control Hook-up.**When using the loose lever (N, Fig. 7) the control tubing (R) is fastened in clamp (S) with screw (M) on side of body just below the air funnel. Fasten the control wire (E) in the binding post (O) on loose lever (N) with the throttle closed allowing 1/16" play between the loose lever (N) and the boss it strikes against on lever (P).

When using the lever (F), the control tubing (R) is fastened in the clamp (S) with screw (M) on the bowl. Extend the control wire (E) through the slot in lever (F) with the dash control pushed in; cut off the wire ½" above the top of lever (F). Slip the ball on the wire (E), allowing 1/16" play between the ball and lever; then bend the wire so the ball cannot slip off. Try the lever, which should work freely and not bind on the wire. Any binding will cause the lever (P) to stick which will cut down the gasoline mileage and upset the idle.

**Starting.**—Open the hand throttle one-half way. Pull out the dash control plunger all the way, re-

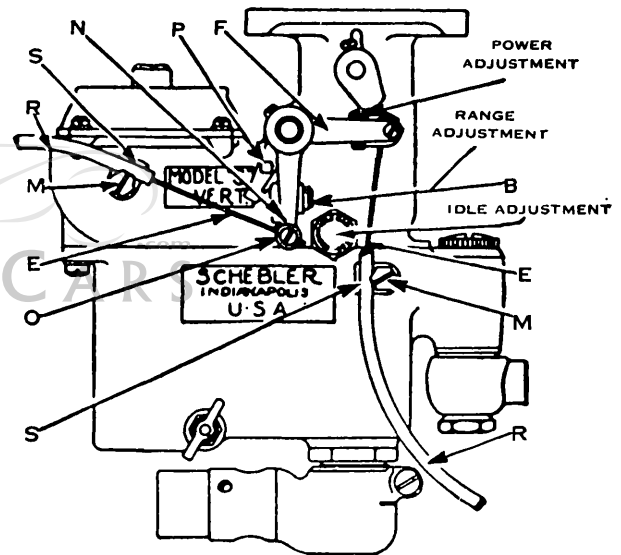


Fig. 7

*Schebler Model S Brass bowl type of carburetor showing location of adjustment screws. Float valve seat is not a removable part.*

tard spark, step on the starter. As soon as the engine starts, push the plunger in about half way and continue to push it in gradually as the engine warms up, until the plunger is entirely in.

**NOTE**—Never attempt to make any adjustments on carburetor until motor is hot.

**Idle Adjustment.**—Turn the idle adjusting knurl (Fig. 7) to the right for a lean mixture, and to the left for a rich mixture. To check the idle adjustment, warm up the motor thoroughly and by this we mean to have a hot motor. Then close the throttle, retard the spark all the way if car has manual spark control and then adjust idle stop screw so that motor will not idle less than five miles per hour on the road. After you have the



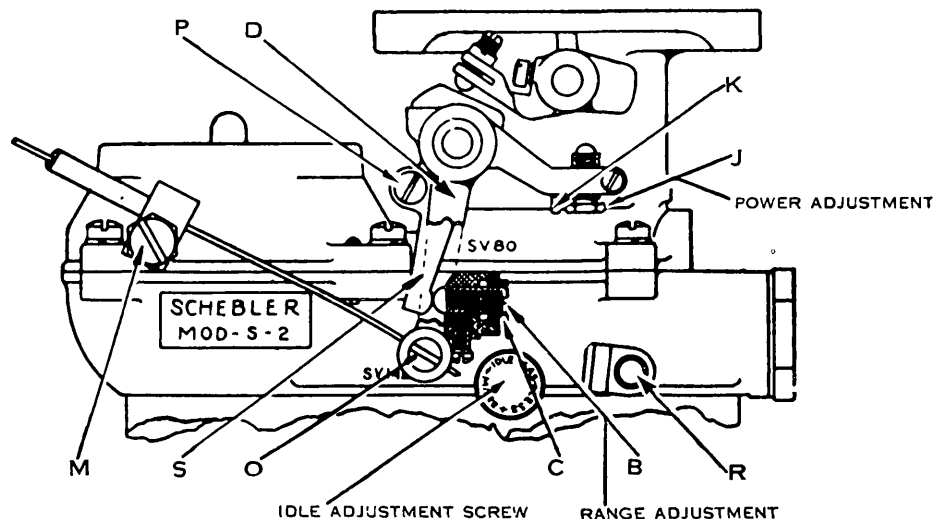


Fig 8

*Schebler Model S with die cast bowl showing the three adjustments.*

*On regular type carburetors (those having brass cast bowl) the float valve seat is not a removable part but is machined in the main bowl casting.*

*On die cast bowl type the float valve and seat are furnished as a separate assembly.*

proper idle engine speed then proceed to check the idle adjustment as follows: Turn the idle adjusting screw to the right (clockwise) turning slowly, watching the motor fan at the same time and continue to turn in this direction, which is the lean direction, until the fan falters or in other words is not turning with a smooth, constant motion. Just as soon as the fan falters stop turning the idle adjustment to the right (lean) and from this point turn the idle adjustment back to the left or rich direction exactly 6 clicks for summer driving and 8 to 9 clicks for winter driving, clicks can be felt while turning the idle adjusting knurl. This will give you an accurate setting on the idle adjustment providing you follow out all of these instructions just as we have outlined them.

**Range Adjustment.**—This adjustment is only effective in the driving range at speeds from twenty to forty miles per hour and does not effect acceleration or hill climbing with wide open throttle.

The adjustment is made by turning the range adjusting screw (B) to the left for a lean mixture and to the right for a rich mixture in the driving range.

To obtain the factory setting, screw the range adjusting screw (B) in or out so the head is flush with the bushing. If the range adjustment is changed it is necessary to readjust the idle mixture.

**Power Adjustment.**—This adjustment as shipped from the factory ordinarily need not be changed. This adjustment is not sensitive to one turn in either direction and is only effective for the wide open throttle running. In changing this adjustment try it on a hill after each change for best results. In extreme cases it may be necessary to furnish a leaner or richer mixture for wide open throttle position. The adjusting cam tappet screw is turned to the left (counter-clockwise) to give a richer mixture and turned to the right (clockwise) to give a leaner mixture.

With throttle wide open adjust the cam tappet screw until there is about  $\frac{1}{8}$  to  $\frac{5}{32}$  of an inch space between the dash control lever (P) and the end of the range screw (B).

## SCHEBLER "S" DIE CAST BOWL

**Installation.**—The dash control tubing should be fastened securely under the clamp and screw assembly (M, Fig. 8) and the dash control wire should be fastened in the binding post (O) so that there is about  $\frac{1}{32}$ " play between the lug on the loose lever (D) and the screw (P) when the throttle is closed and when slotted end of range screw (B) is flush with knurl bushing (C). After tightening screw in binding post (O), straighten out the control wire so that the loose lever (D) does not bind the dash control lever (S) and cause it to stick open. Operate the dash control several times to check this point.

Another standard dash control hook-up may be made by removing the screw (P) and swinging the loose lever (D) up to a horizontal position, and then replace the screw. There should be at least  $\frac{1}{32}$ " between the lug on the loose lever (D) and this screw, when the range screw (B) is flush with the knurl ferrule (C). The dash control tubing should then be fastened under a clamp and screw assembly at the lug (R). This dash control hook-up should be tested several times as explained above.

**Starting and Warming Up.**—Turn on ignition switch, step on starting switch button and pull out dash control to extreme position. After motor fires, immediately push dash control about half way back or to the position where the motor will operate satisfactorily. After motor warms up, push dash control back gradually. Do not use dash control any longer than is necessary.

**To Start a Hot Motor Do Not Use Dash Control**—If trouble is had in starting a hot motor because it is loaded with gasoline, open the hand throttle all the way while cranking with starter until the motor fires, and then close off with the hand throttle just enough to keep the motor from racing until it is cleaned out and runs smoothly.

**Idle Adjustment.**—Turn the idle adjusting knurl (Fig. 8) to the right for a lean mixture, and to the left for a rich mixture. To check the idle adjust-



ment, warm up the motor thoroughly and by this we mean to have a hot motor. Then close the throttle, retard the spark all the way if car has manual spark control and then adjust idle stop screw so that motor will not idle less than five miles per hour on the road. After you have the proper idle engine speed then proceed to check the idle adjustment as follows: Turn the idle adjusting screw to the right (clockwise) turning slowly, watching the motor fan at the same time and continue to turn in this direction, which is the lean direction, until the fan falters or in other words is not turning with a smooth, constant motion. Just as soon as the fan falters stop turning the idle adjustment to the right (lean) and from this point turn the idle adjustment back to the left or rich direction exactly 6 clicks for summer driving and 8 to 9 clicks for winter driving, clicks can be felt while turning the idle adjusting knurl. This will give you an accurate setting on the idle adjustment providing you follow out all of these instructions just as we have outlined them.

**Range Adjustment.**—This adjustment is only effective in the driving range at speeds from twenty to forty miles per hour and does not effect acceleration or hill climbing with wide open throttle.

The adjustment is made by turning the range adjusting screw (B) to the left for a lean mixture and to the right for a rich mixture in the driving range.

This adjustment as shipped from the factory will usually be found to be best, unless a lean or richened mixture is necessary at speeds from twenty to forty miles per hour.

To obtain the factory setting, screw the range adjusting screw (B) in or out so the head is flush with the bushing (C). If the range adjustment is changed it is necessary to readjust the idle mixture.

**Power Adjustment.**—Extensive research indicates that the carburetor will give the best mixture for maximum power on the hills or at high speeds when the power crew (J) is flush with the pin (K) in high altitude, however, more power may be obtained by leaning up on the power mixture—turning (J) to the left (counter-clockwise) 3 to 5 turns.

**Accelerating Pump Adjustment.**—You will note a small lever on accelerating pump which governs the amount of accelerating gas. This lever should be in the raised position for winter, giving a larger amount of extra gas for acceleration. In the summer this lever should be pushed down because in summer you do not need as much gas for quick acceleration.

### SCHEBLER "S" STAMPED BOWL

**Control Hook-up, Starting and Adjusting.**—When using the loose lever (N, Fig. 9) the control tubing (R) is fastened in clamp (S) with screw (M) and the clip (T) on side of body just below the air funnel. Fasten the control wire (E) in the binding post (O) on loose lever (N) with the

throttle closed, allowing 1/16 inch play between the loose lever (N) and the boss (U), it strikes against on lever (P).

When using loose lever (F) the control tubing (R) is pushed through clamp nut (Y) until flush and clamped by tightening nut (Z). The control wire (E) is extended through the binding post (O). Tighten the screw on the binding post, being sure that the control on the dash is pushed down and that there is about 1/16 inch play between the loose lever (F) and the lug (U) on the dash control lever (P).

**Starting.**—Open the throttle one-half way. Pull out the dash control plunger, retard spark, step on the starter. As soon as the engine starts, push the plunger in half way and push in gradually as the engine warms up, until the plunger is entirely in.

**Idle Adjustment.**—Turn the idle adjusting knurl (A, Fig. 9) to the right for a lean mixture, and to the left for a rich mixture. To check the idle adjustment, warm up the motor thoroughly and by this we mean to have a hot motor. Then close the throttle, retard the spark all the way if car has manual spark control and then adjust idle stop screw so that motor will not idle less than five miles per hour on the road. After you have the proper idle engine speed then proceed to check the idle adjustment as follows: Turn the idle adjusting screw (A) to the right (clockwise) turning slowly, watching the motor fan at the same time and continue to turn in this direction, which is the lean direction, until the fan falters or in other words is not turning with a smooth, constant motion. Just as soon as the fan falters stop turning the idle adjustment (A) to the right (lean) and from this point turn the idle adjustment back to the left or rich direction exactly 6 clicks for summer driving and 8 to 9 clicks for winter driving, clicks can be felt while turning the idle adjusting knurl (A). This will give you an accurate setting on the idle adjustment providing you follow out all of these instructions just as we have outlined them.

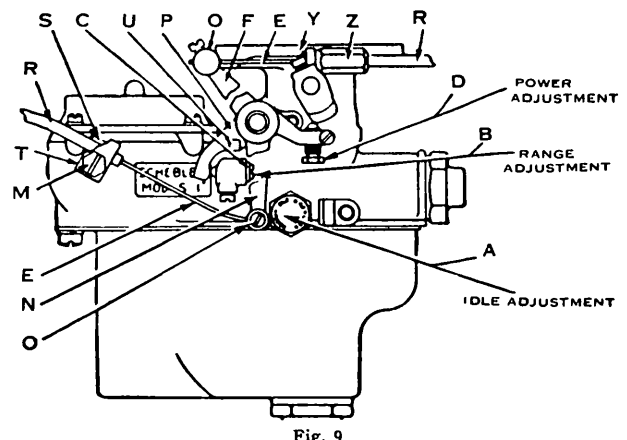


Fig. 9

*Schebler Model S stamped bowl showing the three adjustments. On regular type carburetors (those having brass cast bowl) the float valve seat is not a removable part but is machined in the main bowl casting.*

*On stamped bowl types float valve and seat are furnished as a separate assembly.*



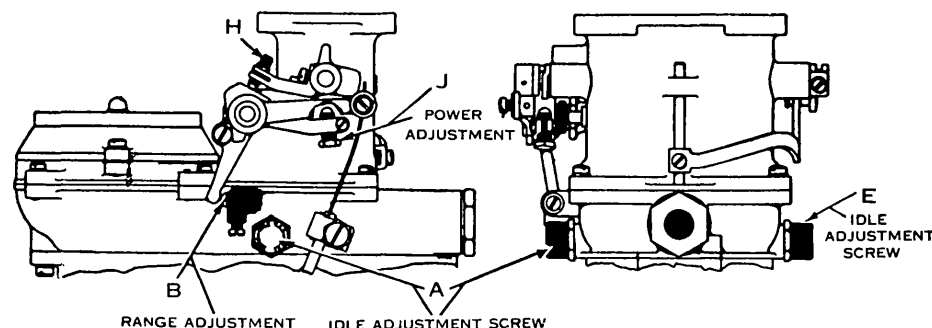


Fig. 10

*Schebler Model S Duplex showing two idle and one power adjustment.*

*The throttle opening and idle adjustment next to the motor controls cylinders numbers 3, 4, 5, 6. The outside throttle opening and idle adjustment controls cylinders numbers 1, 2, 7, 8.*

**Range Adjustment.**—See range adjustment for Schebler model S brass bowl, page 10.

**Power Adjustment.**—See power adjustment for Schebler model S, page 10.

### SCHEBLER "S" DUPLEX

**Starting and Warming Up.**—Push dash control out to extreme position, turn on ignition switch, release clutch, open hand throttle about one-half way and step on starting switch button. After motor fires, immediately move dash control about half way back or to the position where the car will operate satisfactorily. As motor warms up move dash control further back gradually. Do not use dash control any longer than is necessary. When motor is hot do not use dash control. If trouble is had in starting a hot motor, open the hand throttle half way.

**Idle Adjustment.**—The duplex carburetor has two idle adjustments (A, Fig. 10) and (E). Before making any carburetor adjustments warm up the motor to average driving temperature. Both adjustments (A) and (E) turn in the same direction for rich and lean. Turning these adjustments to the right (clockwise) makes the mixture leaner and to the left (counter-clockwise) makes the mixture richer.

The duplex carburetor has two throttle openings into the manifold and the throttle opening and idle adjustment next to the motor always control the four center cylinders, numbers 3, 4, 5, 6. The throttle opening and idle adjustment of carburetor which is on the outside next to the hood of the car always governs the two front and two back cylinders, numbers 1, 2, 7, 8.

To adjust the inside idle adjustment next to the motor, disconnect spark plug wires numbers 1, 2, 7, 8 and ground them some place on the motor head. This leaves the four center cylinders numbers 3, 4, 5, 6 operating, which are governed by inside idle adjustment. Run idling adjustment screw (H) in a little way in order to get a slightly faster idle speed which is necessary when checking four cylinders at a time. Retard spark and depress the air valve of the carburetor  $1/32$  inch to  $1/16$  inch. If the adjustment is lean on the four center cylinders, numbers 3, 4, 5, 6, the motor will die immediately, if adjustment is too rich motor will speed up. When adjustment is just right, you should be able to depress the air valve  $1/32$  to  $1/16$  of an inch and the motor should continue to turn over 2 or 3 revolutions and then start to quit.

To adjust the outside idle adjustment, put the spark plug wires back on numbers 1, 2, 7, 8 plugs and remove wires from numbers 3, 4, 5, 6 and ground them, you are then ready to check the outside idle adjustment by depressing the air valve the same as described above.

After checking the two idle adjustments individually, connect up all spark plug wires so all 8 cylinders will fire and then make a double check by depressing the air valve of the carburetor the same as you did when checking 4 cylinders at a time. Before making your final check with all 8 cylinders firing, check the engine idle speed, setting the idle stop screw (H) so that engine will idle 5 to 6 miles per hour on the road. In making the final check by depressing air valve if you find the job a little rich or lean with all 8 cylinders hooked-up, turn both idle adjustments in the same direction, rich or lean to correct this, turning each one only two or three clicks at a time and then re-check by depressing air valve of carburetor.

**Range Adjustment.**—This adjustment is only effective in the driving range at speeds from twenty to forty miles per hour and does not affect acceleration or hill climbing with wide open throttle.

The adjustment is made by turning the range adjusting screw (B, Fig. 10) to the left for a lean mixture and to the right for a rich mixture in the driving range.

This adjustment as shipped from the factory will usually be found to be best, unless a lean or richened mixture is necessary at speeds from twenty to forty miles per hour.

To obtain the factory setting, screw the range adjusting screw (B) in or out so the head is flush with bushing. If the range adjustment is changed it is necessary to readjust the idle mixture.

**Power Adjustment.**—The carburetor will give the best mixture for speed and maximum power on the hills when the bottom of the head of power screw (J, Fig. 10) is setting so that it measures  $7/32$  inch to the arm that holds screw (J). On the later Duplex carburetors there is a small pin located at the side of screw (J) and the original factory setting is to have the bottom of the head on screw (J) flush with the bottom of the pin. In high altitudes more power can be obtained by leaning up on the power mixture—turning screw (J) to the left (counter-clockwise) 3 to 5 complete turns. Turning screw (J) to the right richens the power mixture.



## SCHEBLER MODEL U

**Control Hook-Up.**—The control hook-up should be made between the dash control tube clamp screw and clip (G, Fig. 12) and the dash control lever (D). The Dash Control should be so adjusted that when the button on the dash is pulled out in the "start" position the lever (D) is down as far as it will go. With the dash control in the "run" position adjust the clamp screw (E) on the wire on lever (D) so that the button sticks out on the dash about  $\frac{1}{8}$ " to be sure that lever (D) is as high as it will go. On the  $\frac{1}{4}$ " (Type U) be sure to thread control wire through the eye in choke wire (F) before running wire into dash control lever (D).

**Starting and Warming Up.**—Pull dash control to the full out or start position, open the throttle about half way, retard spark, turn on ignition switch and step on starting motor switch button. In very cold weather hold dash control out until the motor fires then move in the control a very short distance to keep the motor firing. In warm weather pull the control out just enough to start the motor. The last part of the dash control motion in the out or start position supplies a very rich starting mixture and should be used for as limited a time as possible.

When warming up after the motor is firing, the control can be put where best operation is obtained, gradually pushing the control to the run or down position.

When the motor is hot do not use the dash control.

If trouble is encountered starting a hot motor do not use the dash control but open the hand throttle half way and without using dash control step on starter.

**Important.**—Never attempt to make carburetor adjustments until the motor is hot. If you have a temperature gauge on the dash, it should read around 170 degrees before attempting to check the carburetor adjustments. All other units, such as valves, compression, setting of plug gaps, distributor timing, setting of distributor points and brakes, should be checked according to factory specifications and be sure they are O. K.

**Idling Adjustment.**—The motor should be thoroughly warmed up before adjusting the idle (A, Fig. 12). The spark and throttle should be fully retarded. Turning the end of lever (A) up leans the mixture and turning it down richens the mixture. The markings "R" and "L" on the body also show the rich and lean directions.

The correct idle adjustment should be obtained when pointer is approximately in the center of the range of adjustment between "R" and "L." Allow the motor to idle about one minute and if it rolls from being rich turn the adjustment lean one click at a time until the motor runs steadily. If the motor runs rough from being lean turn the adjustment rich one click at a time until the motor steadies. In warm weather keep the idle adjustment slightly on the lean side. In cold weather set idle rich just under the rolling point.

To change the idle speed adjustment move the idle stop screw (C) in or out to obtain the correct speed. Screwing (C) in will speed up the motor and vice versa. It may be necessary to change the idle adjustment (A) if the idle speed is changed very much. The correct speed is 5 M.P.H. in high gear on level road.

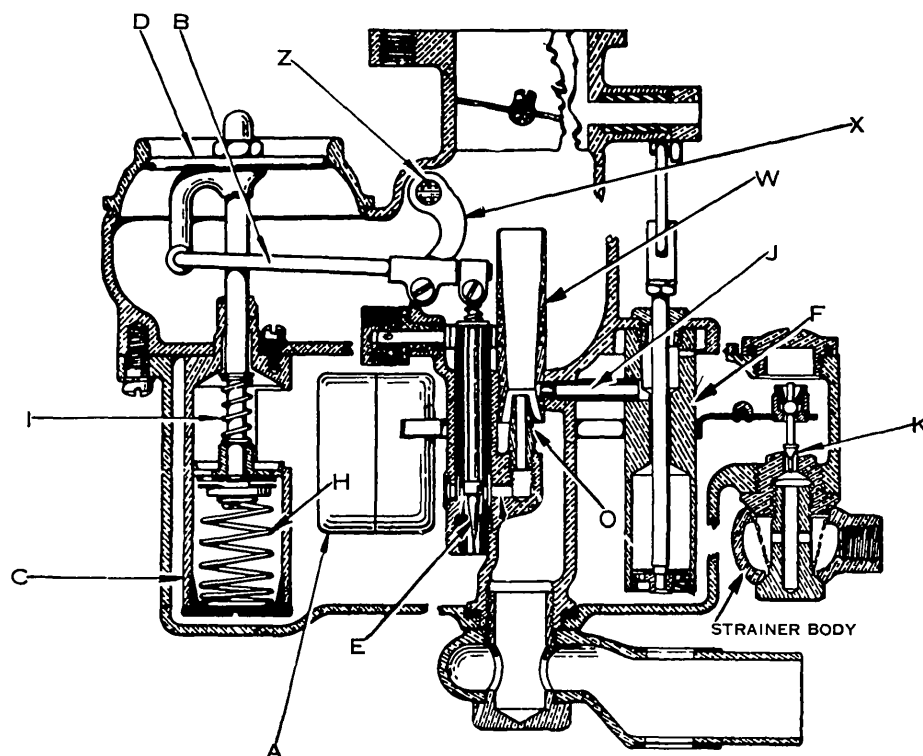


Fig 11

Cross section view of Schebler Model S carburetor showing (A) float (B) needle valve lift lever (C) dash pot assembly (D) air valve (E) needle valve (F) accelerating pump assembly (H) lower air valve spring (I) upper air valve spring (J) metering or cross passage (K) float needle valve assembly (O) main gasoline nozzle (W) venturi (X) fulcrum lever arm (Z) fulcrum lever arm shaft



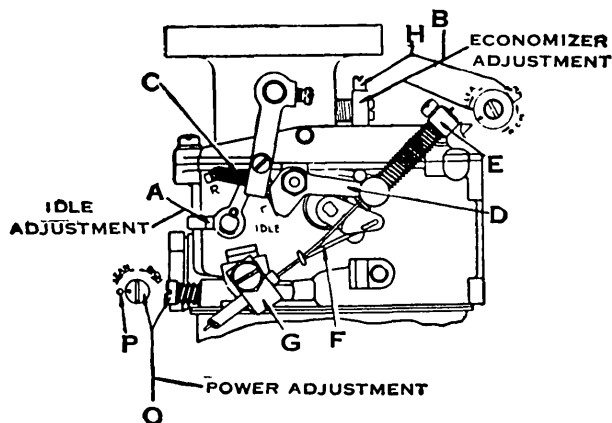


Fig. 12

Schebler Model U showing (A) idle adjustment (C) idle speed adjustment (B) economy adjustment (O) power adjustment.

**Economy Adjustment.**—The factory setting of the economy adjustment (B, Fig. 12) is shown with the arrow mark on the adjustment in line with the arrow mark on the body. To lean the mixture turn the adjustment in the lean direction or counter-clockwise and to richen the mixture turn the adjustment in the rich direction or clockwise.

To accurately check the economy adjustment, warm the motor up thoroughly. Next, retard spark all the way if motor has manual control on spark. Next, with car standing still speed the motor up to a speed corresponding to approximately 30 miles an hour road speed. Do this with the throttle control on the wheel so you can maintain the speed while checking the economy adjustment. With the motor turning over at this speed loosen the lock screw (H) and turn the economy screw (B) out (counter-clockwise) until the motor falters or begins to surge and slow down and at this point, then turn the adjusting screw (B) in (clockwise) until you just get away from the surging point and motor is hitting on all cylinders. This will give you an accurate setting on the economy adjustment. Be careful not to turn screw (B) in too far because if you do you will have a rich setting on economy, but turn it in just enough to get away from the surging of the motor.

After checking this adjustment accurately, hold the economy adjusting screw (B) so it will not

move and turn the collar so that the arrow on the collar is in line with the arrow on the body and then lock the collar by tightening set screw (H).

**Note:** Changing economy adjustment does not affect idle adjustment in any way.

**Power Adjustment.**—The wide open throttle adjustment can be richened by turning power adjustment screw (O, Fig. 12) in (clockwise) and can be made leaner by turning it out (counter-clockwise).

This adjustment should generally be used only for high altitude conditions, or when special fuels are used. The factory setting for this adjustment is when the head of screw (O) is flush with end of pin (P) at the side of the screw and the punch mark on (O) pointing to pin (P).

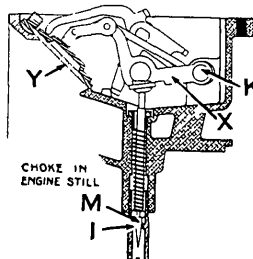


Fig. 14

Cross section of air valve and control levers Model U Schebler carburetor (K) air valve lift lever (X) needle valve (M) fulcrum (I) air valve.

This adjustment affects the economy adjustment (B) and if any change is made in power adjustment (O), the economy adjustment (B) will have to be reset as explained above by setting just above the surging point of the motor. If power adjustment (O) is richened say one-fourth turn, then lean (B) economy adjustment one-fourth turn, or if (O) is leaned one-fourth turn, then richen (B) one-fourth turn.

Remember that the power or wide open throttle adjustment is correct when it leaves the factory except for special cases as mentioned above. Also remember that it is very important to reset the Economy Adjustment (B), if any change is made in Adjustment (O).

The Power Adjustment is not used on the 1" size.

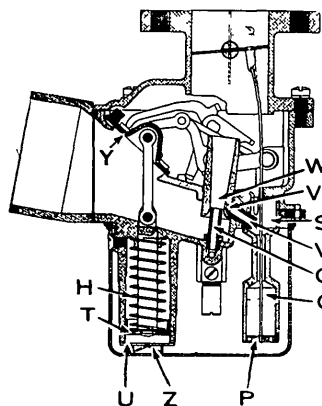


Fig. 13

Cross section of Model U Schebler carburetor showing (H) air valve spring (O) main gasoline nozzle (P) accelerating pump piston (Q) accelerating pump assembly (T) air valve piston (U) dash pot relief valve (V) cross passage to venturi (VI) cross passage metering hole (W) venturi (Y) air valve (Z) dash pot cylinder relief valve spring.

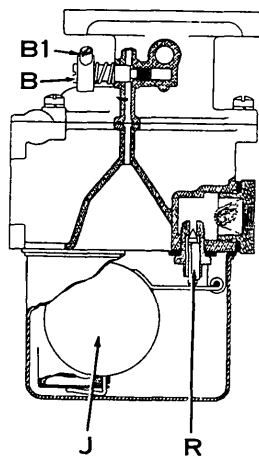


Fig. 15

Cross section of Schebler Model U carburetor showing float valve assembly and economy adjustment (B) economy adjustment screw (B1) economy adjustment lock (I) float (R) float needle valve assembly.

## STROMBERG MODEL R

This carburetor is of the Plain Tube type so-called because, having no air valves or metering



## MODEL IDENTIFICATION

**SERIAL NUMBER:** First No. 4501 (Eight 852), 34501 (Supercharged 852). Stamped on right side of cowl under engine hood.

**ENGINE NUMBER:**—Stamped on left hand upper half of crankcase at front of engine.

## TUNE-UP

**COMPRESSION:**—Ratio—6.2-1 Std. aluminum head.

NOTE—6.5-1 al. head used on Schgd. 851.

Pressure—Approximately 105 lbs. at cranking speed.

**VACUUM READING:**—Gauge should show steady reading of 20" with engine idling at 5-6 MPH.

**FIRING ORDER:** 1-6-2-5-8-3-7-4. See diagram.

**SPARK PLUGS:** Eight—Champion J-6. 14 mm. Metric. Supercharged Eight—Champion J-9. 14 mm. Gaps—.025".

**IGNITION:** See Coil, Condenser, and Distributor.

Breaker Gap—.013-.017" (Eight—after 1000 miles), .018-.020" (Supercharged Eight).

Cam Angle—27.5° closed—Eight, 36° closed—Supercharged Eight (Distr. °).

Synchronization (Schgd. Eight)—Movable contacts open 45° (distr.) after fixed set.

Automatic Advance (Eight)—10° at 1500 RPM (distr.).

Automatic Advance (Schgd. Eight)—5½° at 2000 RPM (distr.).

**IGNITION TIMING:** See Ignition Timing.

Standard Setting—3-4° BTDC. Flywheel mark '1' (1-1½ teeth before DC mark '1/8') at indicator on right side of engine. NOTE—On Schgd. Eight, contacts open alternately at 45-45° (distr.) intervals.

**CARBURETION:** See Carburetor & Carb. Equipment.

Idle Setting—Two screws (Eight), one (Supercharged) midway between 'miss' and 'roll' points. Idle speed 5-6 MPH.

Float Level—Fuel level 15/32" (Eight), 5/8" (Supercharged Eight) below top edge of bowl.

Accelerating Pump—Inner hole (Summer), outer hole (Winter).

Fuel Pump Pressure: 3½ lbs. maximum.

**VALVES:** See Valve Timing.

Tappet Clearance—.008-.010" all valves, engine hot.

**STARTING:** See Battery, Starter, and Generator.

## IGNITION

**Ignition Switch:**—Oakes Hershey type co-incidental ignition switch and steering post lock. Switch has two 'on' positions. Lower or 'STX' position of lever is normal running position with Startix operative. Upper or 'IGN' position should be used to check ignition or whenever automatic cranking is not desired.

**COIL:** Auto-Lite CE-4001G (Eight), CE-4001 (Supercharged Eight). Mounted on right side of engine. Ignition Current—3 amperes idling, 4.5-5.5 amperes at 6.0 volts stopped.

**CONDENSER:** Auto-Lite No. IG-2671 (Eight), IGB-1025C (Supercharged Eight). Capacity—.20-.25 mfd.

**DISTRIBUTOR (EIGHT):** Auto-Lite IGP-4002. Single

breaker, 8 lobe cam, full automatic advance type. No synchronization required.

Breaker Gap—.013-.017" (.015-.019" for first 1000 miles with new points).

Cam Angle or Dwell—Closed 27.5°. Open 17.5° with .017" breaker gap.

Breaker Arm Spring Tension—18 ozs. min., 20 ozs. max.

Automatic Advance			
Distributor	Engine	Distributor	Engine
Degrees	R.P.M.	Degrees	R.P.M.
Start	300	0	600
2	540	4	1080
4	780	8	1560
6	1020	12	2040
8	1260	16	2520
10	1500	20	3000

**DISTRIBUTOR (SCHGD. EIGHT):** Auto-Lite IGH-4027. Two breaker, 4 lobe cam, full automatic advance. Contacts must be synchronized (see Timing).

**Firing Interval:**—Contacts open alternately at 45° intervals corresponding to 90° engine firing intervals.

Breaker Gap—.018-.020".

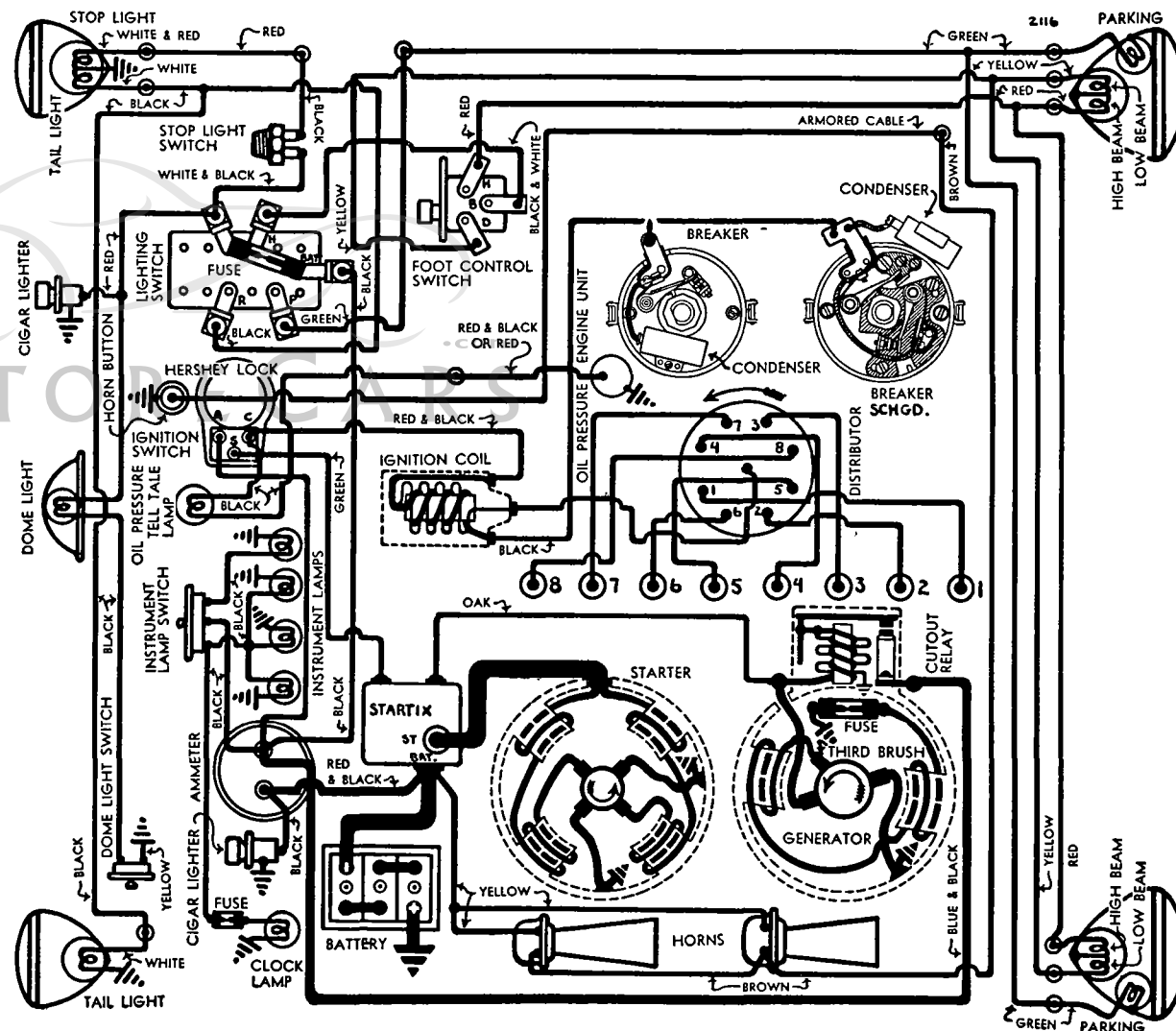
Cam Angle or Dwell—Closed 36°. Open 9° with .020" gap (both sets together when synchronized).

Breaker Arm Spring Tension—16-20 ounces.

Automatic Advance			
Distributor	Engine	Distributor	Engine
Degrees	R.P.M.	Degrees	R.P.M.
Start	400	0	800
1	700	2	1400
2	990	4	1980
3	1280	6	2560
4	1560	8	3120
5.5	2000	11	4000

**Distributor Removal:**—Mounted on cylinder head. To remove, take out hold-down screw in advance arm.

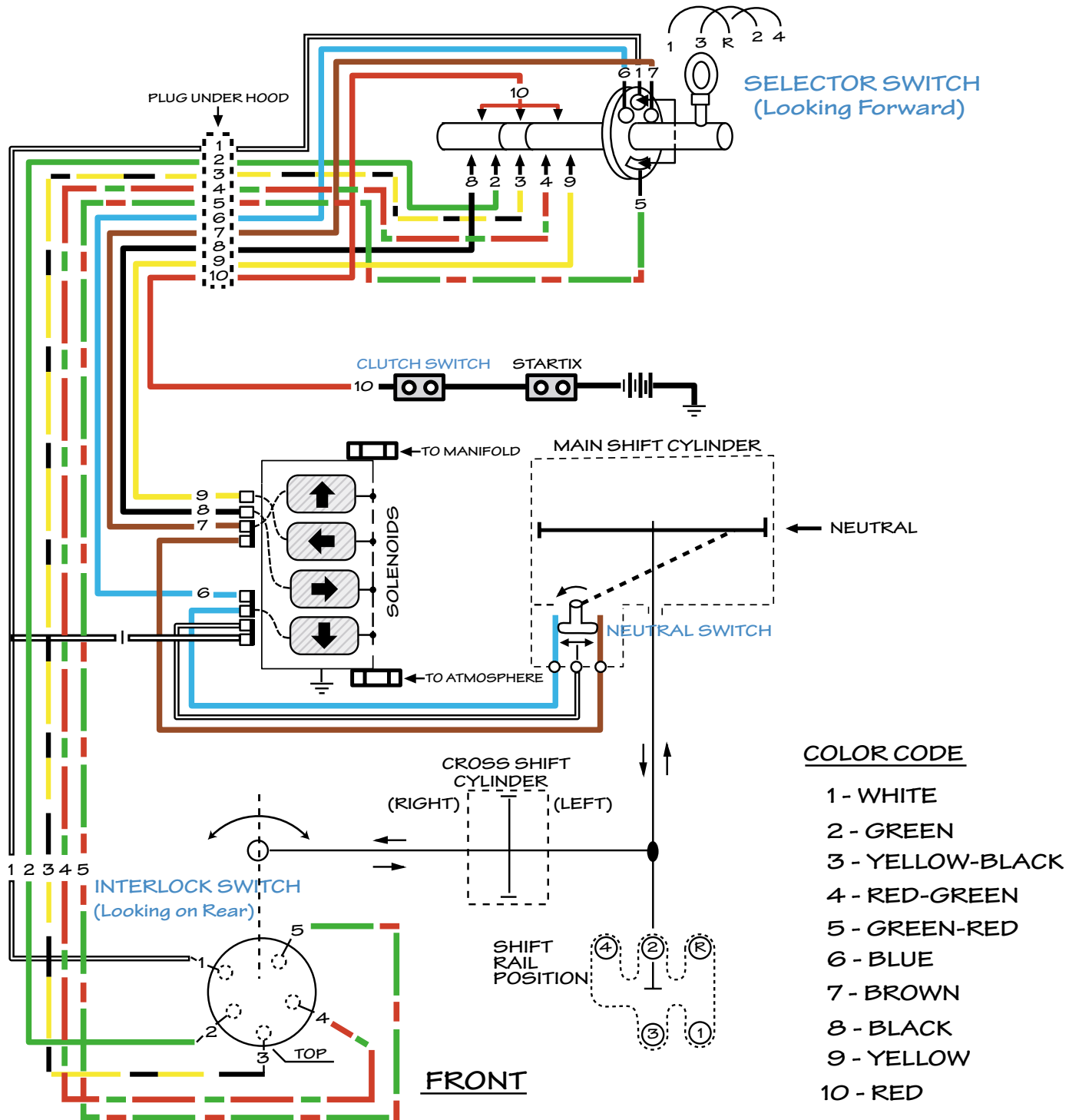
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RIGHT

LEFT



	RIGHT	CENTER	LEFT
IN, OR READY TO GO INTO	4	2, 3	R, 1
CONNECTIONS BETWEEN SWITCH POINTS	4 & 5; 1, 2 & 3	3 & 5; 1, 2 & 4	2 & 5; 1, 3 & 4

## 810/812 CORD SHIFT SCHEMATIC